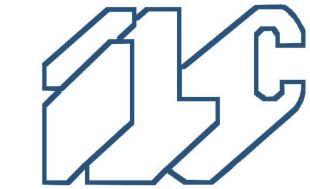

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It-TimeML: TimeML Annotation Scheme for Italian

Version 1.3.1

Technical Report

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September 23, 2010

Contents

1 Introduction

This document[1] describes the adaptation to Italian of the TimeML annotation scheme (Pustejovsky et al., 003a). Compliance with the ISO-TimeML specifications is maintained and preserved. It presents the results of discussions and elaborations developed at the ILC-CNR in Pisa and during the ISO TC 37 SC4 meetings[2]. A special contribution for the revision, testing and soundness of the guidelines has been done by Rachele Sprugnoli and Valentina Bartalesi Lenzi at CELCT in Trento.

The document is structured as follows: section 2 and section 3 will present a brief overview of the purpose of this annotation scheme and will describe the TimeML tags (XML markables), their attributes and links. It will also provide a BNF description of each tag and some explanatory examples. Notice that for clarity's sake the examples will focus only on the tag (or attribute or link) under discussion. Section 4 and section 5 will present instructions on how to annotate the markables and links, respectively. Finally, in section 7 the first release of the Italian TimeML DTD is presented.

In the rest of the document the markup language will be referred as It-TimeML. All examples of the concrete use of the annotation language will be reported by applying in-line annotation to ease the reading of the document. Notice that ISO-TimeML implements stand-off annotation, which is considered a standard and is slightly more expressive than in-line annotation.

2 It-TimeML markable tags and attributes

2.1 Overview

TimeML and It-TimeML are markup languages for the annotation of temporal entities in texts. The identification of these expressions is a critical component for any robust NLP systems, like Information Retrieval or language understanding systems, and recently it has been the topic of lots of research both in computational Linguistics and Artificial Intelligence. The access by content to the information in texts is still an open issue, although some tasks, like named entity recognition and automatic semantic role la-

[1]This work has been financed by CNR grants as part of the project "Modello per analisi e estrazione di eventi e espressioni temporali in testi italiani di ambito generale sfruttando le risorse linguistiche ItalWordNet e PAROLE/SIMPLE/CLIPS e realizzazione di un sistema di annotazione in accordo con gli standard internazionali", bando n. 126.048. BS 01/06, prot. n. 11/06, under the scientific tutoring of Prof.ssa Irina Prodanof.

[2]The meetings took place at Brandeis University (U.S.A.), at Tiburg University (The Netherlands) and at AFNOR (France) between 2006 and 2007.

belling, have provided good improvements. However, there is still a limited ability for marking up texts for real semantic content. One of the field of information which can provide significant steps forward to access by content is represented by temporal information. Time is a pervasive element of human life through which we perceive, inference and reason about the outside world and what (or might) happen in it.

Temporal entities are represented by **events**, **temporal expressions** and the **relations** which are created among these entities. Events represent what happen in the outside world and, thus, are intimately connected to time, which is often realized by temporal expressions, i.e. expressions which provide us with information on **when** something took, is taking or will take place. Without a robust capacity to comprehend the relations between events and times the real aboutness of a document could be missed.

As it often happens in natural language, most information is not explicitly stated, and this is the case of most temporal information. The aim of TimeML and ISO-TimeML, of which It-TimeML is part, is that of annotating all expressions which code temporal information and their relationships, which range from strictly temporal (e.g. "*before*", "*includes*"...), to subordinating (e.g. "*factive*", "*modal*"...), to aspectual or phasal (e.g. "*initiates*", "*finishes*"...). With respect to other existing annotation schemes for temporal annotation, TimeML presents a unifying approach to event-temporal identification, in particular with respect to four big issues:

- event identification and its anchoring in time;
- temporal ordering of events, distinguishing lexical properties from discourse properties;
- reasoning with underspecified temporal expressions;
- reasoning about the persistence of an event.

It-TimeML represents one of the first adaptations and applications of TimeML and ISO-TimeML to a language other than English.

2.2 The tag <EVENT>

In TimeML and ISO-TimeML, "event" is used as a cover term to identify "something that can be said to obtain or hold true, to happen or to occur" (ISO (2008): 1). In literature this notion is often referred to as eventuality (Bach, 1986). It includes all types of actions (punctuals or duratives) and states as well. It is not to be confused with the ontological notion of event

as something which occurs at a certain point in time (e.g. *The meeting is at 2 o'clock*) or which lasts for a certain interval of time (e.g. *John has eaten an apple*). Syntactically, the linguistic elements which may realize an event are the following:

(a) Verbs (finite or non-finite form) e.g.:

- *I pompieri* ***hanno isolato*** *la sala.*
- *Fim-Cisl e Uilm-Uil* ***hanno annunciato*** *oggi una conferenza stampa.*
- *La città mostra i segni della battaglia: cassonetti* ***incendiati*** *o* ***rivoltati****.*

(b) Adjectives e.g.:

- *La coppia, era* ***residente*** *a Milano e stava trascorrendo un periodo di vacanza in Sicilia.*

(c) Predicative sections e.g. :

- *Al Sayed è il nuovo* ***presidente*** *della Fermenta.*

(d) Prepositional phrases, e.g.:

- *Una giovane turista* ***in vacanza*** *nel villaggio "Katibubbo" è morta.*
- *Un centinaio di giovani è tuttora* ***agli arresti****.*

(e) Nouns, which can realize eventualities in three different ways (Gross & Kiefer, 1995):

- deverbal nouns, obtained through a nominalization process from verbs; e.g.: ***fuga***, ***arrivo***, ***corsa***, ***bevuta***, ***accordo***...
- nouns which are not derived from a verb and have an eventive meaning in their lexical properties; e.g.: ***guerra***, ***uragano***, ***assemblea***, ***cerimonia***...
- nouns which normally denote objects but which are assigned an eventive reading either through the process of type-coercion, or through the processes of logical metonymy and coercion induced by temporal prepositions (Pustejovsky, 1995); (the co-textual elements which give rise to the type-coercion phenomenon are underlined) e.g.:
  - *Ho <u>interrotto</u>* ***il libro****.*

– *Vengo a casa dopo* ***la pizza***.
– ***La scuola*** *è durata tutta la mattina*.

The EVENT tag is also used to annotate states, but only a subsets of states are annotated, that is transient states or those which explicitly participates in a temporal relations. Thus, for instance in "*Marco* ***è alto***" no annotation will be performed, since the state of being tall is not transient nor participates explicitly to a temporal relations. On the other hand, "*Marco* ***è uno studente***" and "*Il prezzo del petrolio oggi* ***è*** *di 60$ al barile*" are to be considered as possible markables. See section 4 for details.

2.2.1 BNF description of the EVENT tag

```
attributes ::= eid eiid anchor pred class pos tense aspect vform polarity
               mood [modality] [comment]
id ::= e<integer>
eiid ::= ei<integer>
anchor ::= IDREF
{IDREF ::= (token<integer>)*}
{default, if absent, is an empty string}
pred ::= CDATA
class ::= REPORTING | PERCEPTION | ASPECTUAL | I_ACTION |
            I_STATE | OCCURRENCE | STATE
pos ::=  ADJECTIVE | NOUN | VERB | PREPOSITION | OTHER
tense ::= FUTURE | PAST | PRESENT | NONE
aspect ::= PROGRESSIVE | PERFECTIVE | IMPERFECTIVE | NONE
vform ::= INFINITIVE | GERUND | PARTICIPLE | NONE
          {default, if absent, is NONE}
polarity ::= NEG | POS {default, if absent, is POS}
mood ::= SUBJUNCTIVE | CONDITIONAL | IMPERATIVE | NONE
{default, if absent, is NONE}
modality ::= CDATA
comment ::= CDATA
```

2.2.2 Attributes of EVENT

A. `eid` **(Event ID),** `eiid` **(Event Instance ID)**: obligatory attributes. `eid` assigns a unique ID number to every event `eiid` assign a

unique ID to every event instance, since in some cases it could be necessary to create a non-text consuming tag for a further event instance. `eiid` participates in all TimeML links. It is automatically assigned by the annotation tool every time the `EVENT` tag is assigned to a string.

B. `anchor` **(Anchor)**: obligatory attribute. It is used in stand-off annotation to link each tag to the primary data; e.g.:

(1) *La Procura di Marsala* ***ha aperto*** *un'inchiesta.*

```
...<word eid="token4" token="Marsala"/> <word
id="token5" token="ha"/> <word id="token6"
token="aperto"/>...
<EVENT eid="e1" eiid="ei1" anchor="token6"/>
```

C. `pred` **(Predicate)**: obligatory attribute. It explicits the predicative/semantic content of each event; e.g.

(2) *La Procura di Marsala* ***ha aperto*** *un'inchiesta.*

ha `<EVENT eid="e1" pred="APRIRE">`aperto`</EVENT>`

D. `class` **(Class)**: obligatory attribute. Each event is classified in one of the following classes. These are not the traditional classes for event classification but they are lexical category classes. Their identification is performed by combining semantic and syntactic criteria. It is important to point out that the examples show verbs which belong to a given type, but a certain variability among types has to be taken into account, i.e. the same occurrence of the event in question in a different context not necessarily expresses the same type. The definition of the classes are taken from the ISO-TimeML document draft.

- `REPORTING`: "Reporting events describe the action of a person or an organization declaring something, narrating an event, informing about an event, etc" (ISO (2008): 48); e.g.: *dire, spiegare, raccontare, affermare, notizia, commento...*[3];

  (3) *Punongbayan ha*`<EVENT ...class="REPORTING">`*detto*`</EVENT>` *che dal vulcano fuoriuscivano gas con temperature fino a 1.800 gradi.*

[3]To avoid inconsistencies in class assignement it has been decided to mark as REPORTING all events belonging to the class `statement` in FrameNet (http://framenet.icsi.berkeley.edu/index.php?option=com_wrapperItemid=118frame=Statement). Thanks to Valentina Bartalesi Lensi and Rachele Sprungnoli for this strategy.

(4) <EVENT ...class="REPORTING">*Citando*</EVENT> *l'esempio di...*.

- PERCEPTION: "Events involving the physical perception of another event" (ISO (2008): *ibid.*); e.g.: *vedere, guardare, osservare, ascoltare, sentire,...*

  (5) *Dei testimoni hanno dichiarato alla polizia di aver* <EVENT ...class="PERCEPTION"*visto*</EVENT> *delle persone fuggire.*

- ASPECTUAL: these events code information on a particular phase or aspect in the description of an event. They are a grammatical device which code a kind of temporal information and focus on different facets of the event history. They may signal one of the following aspects:

  (a.) Initiation: *iniziare*, *incominciare*....

  (b.) Reinitiation: *rincominciare*....

  (c.) Termination: *smettere*, *terminare*, *cessare*, *interrompere*.

  (d.) Culmination: *finire*, *completare*...

  (e.) Continuation: *continuare*, *andare avanti*....

  Some examples:

  (6) <EVENT ...class="ASPECTUAL">*iniziando*</EVENT> *il consueto lancio di pietre.*

  (7) *una trattativa già* <EVENT ...class="ASPECTUAL">*conclusa*</EVENT>*per l'acquisizione.*

- I_ACTION: "I_ACTION stands for intensional action. I_ACTIONs describe an action or situation which introduces another event as its argument, **which must be in the text explicitly**". (ISO (2008): 49). It is important to point out the difference between "intensional" and "intentional" or purposeful. I_ACTIONs include but are broader than actions with intended consequences. Note that nouns, in particular nominalizations, can be classified as I_ACTIONS as well. In the examples, I_ACTIONs are in bold and their event arguments, underlined; e.g.:

  (a.) **cercare, provare, tentare**...

  (8) *Compagnie coma la Microsft stanno* <EVENT ...class="I_ACTION"*cercando*</EVENT> *di* *monopolizzare*.

  (b.) **investigare, indagare, ricercare, progettare**...

  (9) *Una nuova task force ha inizato a* <EVENT ...class="I_ACTION">*indagare*</EVENT> *sull'*uccisione* *di 14 donne.*

(10) *è ormai in fase avanzata il* <EVENT ...class="I_ACTION">*progetto*</EVENT> *di ricorrere al mercato.*

(c.) **ritardare, postporre, ostacolare**...

(11) *IsraeIe chiederà agli Stai Uniti di* <EVENT ...class="I_ACTION">*ritardare*</EVENT> *l'attacco contro l'Iraq.*

(d.) **evitare, impedire, prevenire, cancellare, disdire**...

(12) *La* <EVENT ...class="I_ACTION">*cancellazione*</EVENT> *dei voli dell'Alitalia ha creato disagi.*

(13) *La Questura di Livorno ha* <EVENT ...class="I_ACTION">*impedito*</EVENT> *lo svolgimento della manifestazione di Forza Nuova indetta per il 10 Febbraio.*

(e.) **chiedere, ordinare, persuadere, comandare, richiedere, autorizzare**

(14) *Le autorità hanno* <EVENT ...class="I_ACTION">*richiesto*</EVENT> *la massima collaborazione da parte dei mezzi di informazione.*

(f.) **promettere, offrire, assicurare, proporre, accordarsi**

(g.) **nominare, eleggere**

- I_STATE: "They are similar to the events in the previous class. I_STATEs also select for another event as their argument, but contrary to I_ACTIONs, they denote stative situations" (ISO (2008): *ibid.*). The I_STATE is in bold, whereas the embedded argument is underlined. Again, nouns can be classified as I_STATEs.; e.g.:

(a.) **credere, pensare, immaginare, essere sicuro, sospettare**...

(15) <EVENT ...class="I_STATE">*Crediamo*</EVENT> *che le sue parole non abbiano distratto il pubblico da quello che è accaduto.*

(b.) **sembrare, desiderare, bramare, auspicare**...

(16) *Il governo italiano ha* <EVENT ...class="I_STATE">*auspicato*</EVENT> *un'intesa in tempi rapidi.*

(c.) **sperare, aspirare, decidere**...

(17) <EVENT ...class="I_STATE">Sperano</EVENT> *che i residenti rientreranno nelle loro case una volta cessato l'allarme.*

(d.) **temere, odiare, essere preoccupato, aver paura, spaventarsi**...

(18) <EVENT ...class="I_STATE">*Temevano*</EVENT> *per la loro incolumità.*

(e.) **aver bisogno, necessitare**...

(f.) **dovere, potere, volere, sapere, essere in grado di, riuscire**

(19) *I soldati* <EVENT ...class="I_STATE">*devono*</EVENT> *essere ritirati dall'Iraq.*

- OCCURRENCE: This class includes all other types of events describing situations that happen or occur in the world.

  (20) *Il patrimonio dell'Assofondi è* <EVENT ...class="OCCURRENCE">*cresciuto*</EVENT>.

  (21) *I ministri dei 150 Paesi se ne* <EVENT ...class="OCCURRENCE">*tornano*</EVENT> *in patria.*

  (22) <EVENT ...class="OCCURRENCE">*L' uragano*</EVENT>*, definito di " prima grandezza " , è in grado di provocare danni per miliardi di dollari.*

- STATE: States describe **circumstances** in which something obtains or holds true. Some examples are:

  (23) *Numerosi punk* <EVENT ...class="STATE">*sono*</EVENT> *tutt'ora* <EVENT ...class="STATE">*agli*</EVENT> *arresti.*

  (24) *auto e cabine telefoniche* <EVENT ...class="STATE">*distrutte*</EVENT> .

  (25) *Silvio Berlusconi* <EVENT ...class="STATE">*è*</EVENT> *l'attuale* <EVENT ...class="STATE">*proprietario*</EVENT> *di Mediaset.*

  (26) *Una partecipazione* <EVENT ...class="I_ACTION">*garantita*</EVENT> *dalla* <EVENT ...class="STATE">*presenza*</EVENT> *dei nostri ministri.*

  (27) *In totale,* <EVENT ...class="STATE">*sono* </EVENT> *più di 4 milioni gli stranieri regolari in Italia*

Finally, the class of STATE does not contain any instance of I_STATEs which in case of absence of event argument are marked as OCCURRENCE. The only exceptions are related constructions involving the verb "essere" and "avere", which may alternate between STATE and I_STATE.

E. pos **(Part of Speech)**: obligatory attribute. It signals the distinction of the different grammatical categories which may realize an event. Its values

are VERB, for events realized by verbs or VPs, ADJECTIVE, for events realized by adjectives, NOUN, for events realized by nouns, PREPOSITION, for events realized by prepositional phrases, and, OTHER, for all other realizations of events which do not fit into one of the previous categories.

(28) *I pompieri hanno* <EVENT ...pos="VERB">*isolato*</EVENT> *la sala.*

(29) <EVENT ...pos="NOUN">*La caduta*</EVENT> *della base aerea di Ubdina* <EVENT ...pos="VERB">*allontana*</EVENT> *il fronte di 120 km.*

(30) *La coppia era* <EVENT ...pos="ADJECTIVE">*residente*</EVENT> *a Milano e stava* <EVENT ...pos="VERB">*trascorrendo*</EVENT> *un periodo di vacanza in Sicilia.*

(31) *Una giovane turista* <EVENT ...pos="PREPOSITION">*in vacanza*</EVENT> *nel villaggio "Katibubbo"* <EVENT ...pos="VERB">*è morta*</EVENT>.

E. tense (Tense): obligatory attribute. It captures standard distinctions in the grammatical category of verbal tense. It can have values PRESENT, PAST, FUTURE, or NONE. The values assigned to this attribute mirror the highly-surface based character of TimeML and ISO-TimeML. The values presented are based on classical tense distinctions in Italian. It is important to stress the fact that on the level of general temporal reference there are no major differences between Italian and English and also among other Indo-European languages. In Table 1, correspondences between the classical grammatical tense classification system and the TimeML values are presented:

Table 1: *Tense classification and corresponding TimeML values.*

Classical Grammatical Tense Classification	**It-TimeML values**
Presente Semplice	PRESENT
Passato Composto	PRESENT
Imperfetto	PAST
Passato Semplice	PAST
Trapassato	PAST
Piucchepperfetto (or Trapassato Prossimo)	PAST
Futuro Semplice	FUTURE
Futuro Composto	FUTURE

Section 4.1.10 on page 37 will present rules for annotation of the attribute `tense` with detailed examples.

F. `aspect` **(Aspect)**: obligatory attribute. It captures standard distinctions in the grammatical category of semantic aspect. It can have values `PROGRESSIVE, PERFECTIVE, IMPERFECTIVE`, or `NONE`. With respect to English, Italian has not a clear-cut morphological distinction to code semantic aspect. It is recognized and determined more through a combination of morphological, semantic and pragmatic information. Note that due to language specific issues and in the perspective of an automatic annotation process we did not propose to use fine-grained values like *aorist*, *perfect*, *continuous* or *habitual* but general cover term like `PERFECTIVE` and `IMPERFECTIVE`. The `PROGRESSIVE` value, which is a specification of the `IMPERFECTIVE` aspect, is restricted to explicit cases realized in Italian by an aspectual periphrasis (e.g. "*sto giocando*"). Section 4.1.10 on page 37 will present rules for the annotation of the attribute `aspect` with detailed examples.

G. `polarity` **(Polarity)**: obligatory attribute. It captures the grammatical category that distinguishes affirmative and negative statements. Its values are `POS` in affirmative sentences and `NEG` in negative ones.

H. `mood` **(Mood)**: obligatory attribute. It captures the contrastive grammatical expressions of different modalities about the event realization. It can have the following values:

- `NONE`: it is used as the default value; indicative is considered the default.

  (32) *Le forze dell'ordine hanno* `<EVENT ...mood="NONE">`*schierato*`</EVENT>` *in campo 3.000 agenti.*

- `CONDITIONAL`: it signals the conditional mood which in Italian is realized by the morphological inflection on the verb. It is used to speak of an event whose realization is dependent on a certain condition, or to signal the future-in-the-past.

  (33) `<EVENT ...mood="COND">`*Mangerei*`</EVENT>` *del pesce.*

- `SUBJUNCTIVE`: it has several uses in independent clauses and is required for certain types of dependent clauses.

  (34) `<EVENT mood="NONE">`*Voglio*`</EVENT>` *che tu te ne* `<EVENT ...mood="SUBJUNCTIVE">`*vada*`</EVENT>`.

- IMPERATIVE: it expresses direct commands or requests. It is also used to signal a prohibition, permission or any other kind of exhortation.

  (35) <EVENT mood="IMPERATIVE">*Taci*</EVENT>

I. vForm **(Verb form)**: obligatory attribute. It captures the distinctions between finite and non-finite verb forms. Its values are NONE, INIFINITIVE, PARTICIPLE and GERUND. The value for all finite verb forms is NONE.

(36) *l'ultima area del comprensorio romano Torre Spaccata che ancora* <EVENT ...vForm="NONE">*mancava*</EVENT> *per* <EVENT ...vForm="INFINITIVE">*unificare*</EVENT> *la proprietà.*

(37) <EVENT ...vForm="PARTICIPLE">*Certificato*</EVENT> *il bilancio della società.*

(38) *I Fumagalli, infatti, hanno* <EVENT ...vForm="NONE">*incaricato*</EVENT> *lo studio di un agente di cambio milanese.*

(39) *hanno* <EVENT ...vForm="NONE">*attaccato*</EVENT> *la Flm nazionale e regionale* <EVENT ...vForm="GERUND">*accusando*</EVENT>*le di averli* <EVENT ...vForm="INFINITIVE">*esclusi*</EVENT>.

J. modality **(Modality)**: optional attribute. It is used to convey the different degrees of modality nature of an event, mainly epistemic and deontic. Its values are represented by the modal verb itself.

(40) *I profughi* <EVENT ...modality="DOVERE">*devono*</EVENT> <EVENT>*abbandonare*</EVENT> *le loro case.*

2.3 The tag <TIMEX3>

What is normally referred to with the label *temporal expressions* (i.e. timexes) in the NLP community is only a small and closed subset of words which have temporal reference or meaning, in particular, as it is stated in the annotation guidelines of TIDES (2001) "the flagging of temporal expressions is restricted to those temporal expressions which contained a reserved time word, called **lexical trigger**" (Ferro et al. (2001): 2). This means that many other words (e.g. *scuola*, *presidenza*, *incubazione* ...) which can assume a temporal reading are excluded. The specifics of the TimeML tagset for annotating temporal expressions differ in details from both the TIMEX tag in STAG and

the TIMEX2 tag in TIDES, though some common points are kept.
The <TIMEX3> tag, thus, marks up any temporal expression referring to:

(a.) Day times (*mezzogiorno, 3, la sera, la mattina ...*);

(b.) Dates of different granularity: days (*ieri, 8 Gennaio 1980, venerdì scorso, sabato ...*), weeks (*la prossima settimana, la seconda settimana del mese ...*), months (*tra due mesi, il mese prossimo, l' Agosto del 1980 ...*), seasons or business quarters (*la scorsa primavera, lo scorso semestre, il primo trimestre, il bimestre ...*), years (*1980, l'anno scorso, ...*), centuries, ...

(c.) Durations (*due mesi, cinque ore, nei prossimi anni, il periodo ...*).

(d.) Sets (*una volta al mese, ogni martedì ...*).

The linguistic realizations (parts-of-speech) of temporal expressions present a reduced set of variations with respect to the eventualities and are, in a certain way, more regular. In Table 2 we report some of the possible linguistic realizations of temporal expressions together with some examples.

Table 2: *Temporal expression triggers and corresponding POS.*

Timex Lexical Triggers	**POS**
agosto, alba, anniversario, domenica, estate, giornata, serata, futuro, lustro, stagione...	Nouns
Natale, Pasqua, Capodanno, Ferragosto	Proper Nouns
25/07/2007, 1980, 13:11...	Calendar/Time Patterns
annuale, primaverile, estivo, mensile...	Adjectives
annualmente, oggi, ora, allora, adesso, finora, ieri, tutt'ora...	Adverbs
primo, secondo, 1, 31, 28...	Numbers

Additional properties of timexes related to their meaning are:

- **Granularity** level: the value of a timex may be more or less precise. An expression like "*lo scorso fine settimana*" can refer to the entire week-end or a specific day in the week-end. The timeline format used to normalize the values of timexes, i.e. to assign them a standard value corresponding to point (or interval) on a calendar/clock or to an unanchored duration, is based on the Gregorian calendar, and derived from

the ISO 8601 standard for time values. The format is of the general form *YYYY-MM-[WW]DDhh:mm:ss*.This means that the granularity of an expression can have the values *Year*, *Month*, *Week*, *Day*, *Hour*, *Minute* and *Second* including also *Millennium* (M), *Century* (C), and *Decades* (D).

- **Fuzziness**: many timexes have fuzzy boundaries in their intended values with respect to when the denoted time period starts and ends, e.g.; *ora*, *circa tre anni*, *nei primi anni sessanta* ...

- **Ambiguity**: like many other expressions, timexes can be ambiguous, e.g. the expression "*il prossimo mese*" if uttered on July 25th, 2007, can mean August 2007, or exactly one month after the moment of utterance, i.e. August 25th. Disambiguating a timex means figuring out which of the possible values is the intended one.

2.3.1 BNF description of the TIMEX3 tag

```
attributes ::= tid anchor type [functionInDocument][beginPoint]
          [endPoint] [quant][freq][temporalFunction]
          value [valueFromFunction] [mod] [anchorTimeID] comment
tid ::= ID
{ID ::= TimeID
TimeID ::= t<integer>}
anchor ::= IDREF
{anchor ::=(token<integer>)
type ::= DATE | TIME | DURATION | SET
beginPoint ::= IDREF
{beginPoint ::= TimeID}
endPoint ::= IDREF
{endPoint ::= TimeID}
quant ::= CDATA
freq ::= CDATA
functionInDocument ::= CREATION_TIME | EXPIRATION_TIME |
                       MODIFICATION_TIME | PUBLICATION_TIME |
                       RELEASE_TIME | RECEPTION_TIME |  NONE
                  {default, if absent, is 'NONE'}
temporalFunction ::= true | false {default, if absent, is 'false'}
{temporalFunction ::= boolean}
value ::= CDATA
{value ::= duration | dateTime | time | date | gYearMonth |
            gYear | gMonthDay | gDay | gMonth}
```

```
valueFromFunction ::= IDREF
{valueFromFunction ::= TemporalFunctionID
TemporalFunctionID ::= tf<integer>}
mod ::= BEFORE | AFTER | ON_OR_BEFORE | ON_OR_AFTER |
             LESS_THAN | MORE_THAN | EQUAL_OR_LESS |
             EQUAL_OR_MORE | START | MID | END | APPROX
anchorTimeID ::= IDREF
{anchorTimeID ::= TimeID}
comment ::= CDATA
```

2.3.2 Attributes for TIMEX3

A. `tid` **(Temporal Expression ID)**: obligatory attribute. It assigns a unique ID number to each timex instance. It is automatically assigned by the annotation tool whenever the `TIMEX3` tag is assigned to a string.

B. `anchor` **(Anchor)**: obligatory attribute. It is used in stand-off annotation to link each tag to the primary data, see point B, section 2.2.2 on page 6.

C. `type` **(Type)**: obligatory attribute. It specifies the type of the timex. Its values are `DATE`, `TIME`, `DURATION` and `SET`.

- `DATE`: this type applies to all temporal expressions which describe a calendar time.

  (41) *1,6 milioni di sterline di utile nel* <TIMEX3 ...type="DATE">*1985*</TIMEX3>.

  (42) *Ha sostanzialmente contestato l'accordo raggiunto* <TIMEX3 ...type="DATE">*venerdì scorso*</TIMEX3>.

- `TIME`: the temporal expression refers to a time of the day, even if in a very indefinite way. Clock times are classified as `TIME` as well.

  (43) *L' ultima ondata di violenza si è scatenata* <TIMEX3 ...type="TIME">*sabato notte*</TIMEX3>.

  (44) *L'assemblea è iniziata alle* <TIMEX3 ...type="TIME">*15.00*</TIMEX3>.

- `DURATION`: the expression describes a duration, i.e. a period of time not pointing to any specif area in the time axis. This value is assigned only to explicit durations.

(45) *La trattativa dura ormai da* <TIMEX3 ...type="DURATION">*oltre un mese*</TIMEX3>.

(46) *Un incremento del 105 per cento in* <TIMEX3 ...type="DURATION">*10 mesi*</TIMEX3>.

As a rule, if any specific calendar information is supplied in the temporal expression, then the `type` of the `TIMEX3` must be either `DATE` or `TIME`. For instance, an expression like "1985" cannot be marked as a `DURATION`, even if the context may suggest that an event holds throughout that year. Temporal expressions like the former "must always be of type `DATE`, since they refer to a particular area in the temporal axis –even though that area spans over a period of time" (ISO (2008): 57).

- `SET`: The expression describes a set of times.

(47) *Meno di un milione di tonnellate* <TIMEX3 ...type="SET">*all'anno*</TIMEX3>.

(48) *un raduno che dal 1982 si tiene* <TIMEX3 ...type="SET">*quasi tutti gli anni*</TIMEX3>.

D. `value` **(Value)**: obligatory attribute. It expresses the temporal value of the temporal expression, i.e. it assigns to the temporal expression a normalized value corresponding to a calendar date, a clock time or special formats for durations based on the ISO 8601 standard and its extensions in TIDES. The format of this attribute value is determined by the `type` attribute. Details and examples will be provided in section 4.2.

E. `mod` **(Modifier)**: optional attribute. This attribute is inherited directly from the `TIMEX2 MOD` attribute. It is used to signal the presence of a modifier which changes/influences the interpretation of the `value` attribute. In general, `mod` captures the meaning of some quantifier modifiers (e.g. *circa*, *oltre*...) and lexicalized aspectual markers (*inizio*, *fine*, *tardo*...). Its values are `BEFORE`, `AFTER`, `ON_OR_AFTER`, `LESS_THAN`, `MORE_THAN`, `EQUAL_OR_LESS`, `EQUAL_OR_MORE`, `START`, `MID`, `END`, and `APPROX`. Details and a table with correspondences between linguistic tokens and values will be provided in section 4.2.

F. `temporalFunction` **(Temporal Function)**: optional attribute. Its values are `true` and `false`. "It expresses whether the value of the temporal expression needs to be determined via evaluation of a temporal function.

Temporal functions will be applied as a postprocess." (ISO (2008): 59). Details on how to assign the values and examples in section 4.2.

G. `anchorTimeID` **(Temporal anchor time ID)**: optional attribute. It introduces the `id` value of the temporal expression to which the `TIMEX3`-marked expression is linked in order to compute its value. To illustrate how this attribute works, consider the following example:

(49) `<TIMEX3>`*Ieri*`</TIMEX3>` *circa mille giovani hanno lasciato la città.*

"*Ieri*" requires the application of a temporal function: to know the calendar date corresponding to "*Ieri*" we need to identify its temporal anchor, that is another temporal expression which helps us to recover all the necessary information to identify its Year, Month and Day. Imagine this anchor is the time at which the document has been created (i.e. 26/11/2008), whose `id` is `t0`, then we will obtain this representation:

(50) `<TIMEX3 ...anchorTimeID="t0">`*Ieri*`</TIMEX3>` *circa mille giovani hanno lasciato la città.*

H. `valueFromFunction` **(Value from Function)**: optional attribute. It is not relevant for manual annotation. Human annotators should ignore it.

I. `functionInDocument` **(Function in document)**: optional attributes. It indicates what is the function of a temporal expression in the document and its function as a temporal anchor for other temporal expressions. Its values are:

(a.) `CREATION_TIME`: the time the text is created;

(b.) `MODIFICATION_TIME`: the time the text is modified;

(c.) `PUBLICATION_TIME`: the time the text is published;

(d.) `RELEASE_TIME`: the time it may be released (if not immediately);

(e.) `RECEPTION_TIME`: the time it is received by a reader;

(f.) `EXPIRATION_TIME`: the time that the text expires (if any)

(g.) `NONE`: the default value; a general time without a particular reference to document 's life.

J. `beginPoint` **(Beginning point) and** `endPoint` **(Ending point)**: optional attributes. These attributes are used to strengthen the annotation of durations. They are used when a duration is (or can be) anchored to one or two temporal expressions which signal(s) its beginning and/or ending point(s). In some ways these attributes are similar to `anchorTimeID`.

K. `quant` **(Quantifier) and** `freq` **(Frequency)**: optional attributes. These attributes are used in conjunction with temporal expressions classified with type `SET`. `quant` is a literal from the text; it corresponds to general quantifiers like "*ogni*", "*tutto*" .... `freq` is expressed by a integer and a time granularity (e.g. D = Day, Y = Year, M = Month, X = not specified ...) and it expresses the frequency at which the temporal expression regularly re-occurs. These attributes are used only when their values are explicitly supplied by the temporal expression.

(51) `<TIMEX3 ...type="SET" freq="1X">`*una volta a settimana*`</TIMEX3>`.

(52) `<TIMEX3 ...type="SET" quant="OGNI">`*ogni tre settimane*`</TIMEX3>`.

2.4 The tag `<SIGNAL>`

This tag is used to mark up all those textual elements which make explicit a relation between two entities. Entities' relations may be of three kinds:

(a.) relations between two temporal expressions (timex - timex);

(b.) relations between a temporal expression and an event (timex - event); and

(c.) relations between two events (event - event)

The range of linguistic expressions which are to be marked as events is restricted to:

- Temporal prepositions: *prima*, *durante*, all simple and complex prepositions followed by a temporal expression...;
- Temporal conjunctions: *prima, quando, mentre ...*;
- Temporal adverbs: *intanto, nel frattempo, ...*

- Special characters: "-" and "/", in temporal expressions denoting ranges (e.g. *26 - 28 Settembre 2006*);
- Propositions and conjunctions signalling a subordinating relations (see section 3.3): *per*, *affinché*, *se*....

2.4.1 BNF description of the SIGNAL tag

```
attributes ::= sid anchor
sid ::= ID
{ID ::= s<integer>}
anchor ::= IDREF
{anchor ::= (token<integer>)*}
```

2.4.2 Attribute for SIGNAL

A. ID (Signal ID): obligatory attribute. It assigns a unique ID number to each signal instance.

3 The link tags: <TLINK>, <ALINK> and <SLINK>

These tags are not markables. They are used to signal three different kinds of relations which may exists between the annotated entities.

3.1 TLINK

The TLINK tag represents the temporal relationship holding between two events, two temporal expressions, or between an event and a temporal expression, and indicates how they are temporally related. Possible temporal relations are:

(a.) **Simultaneous**: the two events are judged as simultaneous if they happen at the same time, or if an event is perceived as happening at a moment (point or interval) in time:

(53) <EVENT>*Fumo*</EVENT> *instancabilmente quando* <EVENT>*scrivo*</EVENT>.

(b.) **Before**: an event (or temporal expression) is before another:

(54) *Circa mille giovani hanno* <EVENT>*lasciato*</EVENT> *la città. Un grande magazzino di generi alimentari a buon mercato è stato* <EVENT>*saccheggiato*</EVENT>.

(c.) **After**: the inverse of the preceding relation;

(d.) **Immediately before**: one immediately before the other:

(55) *Nell'*<EVENT>*impatto*</EVENT> *tutti i passeggeri a bordo* <EVENT>*sono morti*</EVENT>.

(e.) **Immediately after**: the inverse of the preceding relation;

(f.) **Measure**: this value is used to connect an event and a temporal expression of type DURATION. Not all temporal expressions of type duration can participate in this link but only those which provide information on the duration of the related event (i.e. temporal expressions which answer to the question "how long the event X lasts/lated?"):

(56) *Marco* <EVENT>*insegna*</EVENT> *per* <TIMEX3>*un'ora*<TIMEX3> il *lunedì*.

(g.) **Includes**: one entity includes the other[4]:

(57) *Marco è* <EVENT>*arrivato*</EVENT> *a Boston* <TIMEX3>*lunedì*</TIMEX3>.

(h.) **Is_included**: the inverse of the preceding relation;

(i.) **Begins**: one entity being the beginning of the other:

(58) *Si* <EVENT>*cerca*</EVENT> *un accordo da* <TIMEX3>*ieri*</TMEX3>.

(j.) **Begun_by**: the inverse of the preceding relation;

(k.) **Ends**: one entity being the ending of another:

(59) *Marco è stato* <EVENT>*in palestra*</EVENT> *fino alle* <TIMEX3>*7*</TIMEX3>.

(l.) **Ended_by**: the inverse of the preceding relation;

TLINKs are also used to in the following situations:

- **To signal event identity**: the same event can be referred more than once in the document. These cases, which corresponds to istances of anaphoric, i.e. coreferential, relations are marked by using the TLINK e.g.:

[4]It corresponds to Allen (1984)'s during relation.

(60) *Marco ha* <EVENT>*guidato*$_1$</EVENT> *fino a Boston ieri. Durante* <EVENT>*la guida*$_1$</EVENT> *ha mangiato una ciambella.*

As the indexes shows the events " *(ha) guidato*" and "*guida*" express the same event, the latter being coreferential with the former.

- **Causative constructions**: two cases of causative constructions can be identified:

  (i.) EVENT causare EVENT

  (61) <EVENT>*La pioggia*</EVENT> *ha* <EVENT>*causato*</EVENT> <EVENT>*delle alluvioni*</EVENT>.

  (ii.) HUMAN — ENTITY causare EVENT

  (62) *Marco ha* <EVENT>*causato*</EVENT> <EVENT>*l'incendio*</EVENT>.

  TLINK should be used only in cases like (i.). Cases like (ii.) are not to be tagged with TLINK. Details for the annotation of cases like (i.) will be provided in section 5.1.

- **Light verb constructions (*costruzioni a verbo supporto*)**: the relation between the light verb and the nominal is marked with a TLINK. Details and examples in section 5.1.

3.1.1 BNF description of TLINK

```
attributes ::= [lid] [origin] (eventInstanceID | timeID) [signalID] [syntax]
               (relatedToEventInstance | relatedToTime) relType
lid ::= ID
{id ::= LinkID
LinkID ::= l<integer>}
origin ::= CDATA
eventInstanceID ::= IDREF
{eventInstanceID ::= EventInstanceID}
timeID ::= IDREF
{timeID ::= TimeID}
signalID ::= IDREF
{signalID ::= SignalID}
relatedToEventInstance ::= IDREF
{relatedToEventInstance ::= EventInstanceID}
relatedToTime ::= IDREF
```

```
{relatedToTime ::= TimeID}
relType ::= BEFORE | AFTER | INCLUDES | IS_INCLUDED
            | SIMULTANEOUS | IAFTER | IBEFORE | IDENTITY | BEGINS
            | ENDS | BEGUN_BY | ENDED_BY | MEASURE
syntax ::= CDATA
```

3.1.2 Attributes of TLINK

A. ID **(Temporal Link ID)**: obligatory attribute. It assigns a unique ID number to each temporal link.

B. eventInstanceID **(Event Instance ID) or** timeID **(temporal expression ID)**: obligatory attributes. These attributes signal, respectively, the ID of the event instance **or** that of the temporal expression from which the temporal relation is created.

C. signalID **(Signal ID)**: optional attribute. It represents the ID of the SIGNAL which signals the existence of a temporal relation between two entities.

D. relatedToEventInstance **(Related to the event instance) or** relatedToTime **(Related to the temporal expression)**: obligatory attributes. They represent the ID of the target event **or** of temporal expression which is related to either the event instance, with eventID, or the time expression, with timeID.

E. relType **(Relation type)**: obligatory attribute. This is the core attribute of this link, it explicits the temporal relation between the entities involved. Its values are: BEFORE, AFTER, INCLUDES, IS_INCLUDED, MEASURE, SIMULTANEOUS, IAFTER, IBEFORE, IDENTITY, BEGINS, ENDS, BEGUN_BY, ENDED_BY. There will be only **one relation** assigned per TLINK. Details on their annotation and examples will be presented in section 5.1.

F. origin **(Origin)**: optional attribute. It signals whether the tlink has been created manually or by closure.

3.2 ALINK

An ALINK, or aspectual link, represents relations between aspectual or phasal events (EVENT class="ASPECTUAL") and their event arguments. There are different types of aspectual relations according to the semantics of the phasal/aspectual

event (see also section 2.2.2 point **D.**):

(a.) **Initiation**:

(63) *Il Parlamento* <EVENT ...class="ASPECTUAL">*incomincerà*</EVENT> <TIMEX3>*il 3 aprile prossimo*</TIMEX3> *un* <EVENT ...class="OCCURRENCE">*dibattito*</EVENT>.

(b.) **Culmination**:

(64) *La Germania federale ha* <EVENT ...class="ASPECTUAL">*concluso*</EVENT> *un* <EVENT ...class="OCCURRENCE">*accordo*</EVENT> *con gli Stati Uniti.*

(c.) **Termination**:

(65) *Marco* <EVENT ...class="ASPECTUAL">*ha smesso*</EVENT> *di* <EVENT ...class="ASPECTUAL">*fumare*¡/EVENT¿.

(d.) **Continuation**:

(66) <EVENT ...class="OCCURRENCE">*La trattativa*</EVENT> <EVENT ...class="ASPECTUAL">*dura*</EVENT> *ormai* <SIGNAL sid="s1">da</SIGNAL> <TIMEX3>oltre un mese</TIMEX3>.

(e.) **Reinitiation**:

(67) *Le lezioni* <EVENT ...class="ASPECTUAL">*riprenderanno*</EVENT> <TIMEX3>*il 3 aprile prossimo*</TIMEX3>.

3.2.1 BNF description of ALINK

```
attributes ::= [lid] eventInstanceID [signalID]
               relatedToEventInstance relType [syntax]
lid ::= ID
{lID ::= LinkID
LinkID ::= l<integer>}
origin ::= CDATA
eventInstanceID ::= IDREF
{eventInstanceID ::= EventInstanceID}
signalID ::= IDREF
{signalID ::= SignalID}
```

```
relatedToEventInstance ::= IDREF
{relatedToEventInstance ::= EventInstanceID}
relType ::= INITIATES | CULMINATES | TERMINATES
               | CONTINUES | REINITIATES
syntax ::= CDATA
```

3.2.2 Attributes of ALINK

A. `lid` **(Aspectual Link ID)**: obligatory attribute. It assigns a unique ID number to each aspectual link.

B. `signalID` **(Signal ID)**: optional attribute. It represents the ID of the `SIGNAL` which signals the aspectual relation between the two events.

C. `relatedToEventInstance` **(Related to event instance)**: obligatory attribute. It represents the ID of the event argument which is related to the aspectual event.

D. `relType` **(Relation type)**: obligatory attribute. This is the core attribute of this link, it explicits the type of aspectual relation between the events involved. Its values are: `INITIATES`, `CULMINATES`, `TERMINATES`, `CONTINUES`, `REINITIATES`. There will be only **one relation** assigned per `ALINK`. Details on their annotation and examples will be presented in section 5.2.

3.3 SLINK

An `SLINK`, or subordination link, is used to explicit particular types of subordinating relations between two events for contexts introducing relations between two events. An `SLINK` may exist between an event and its argument, being this latter realized by a complement or in a subordinate clause. With respect to the other two link tags, `SLINK` are not unique, i.e. an event may be slink-ed to more than one event.
`SLINKs` can be of two types:

- **Lexically-based**: "they are triggered by an event of class `I_ACTION`, `I_STATE`, `PERCEPTION`, or `REPORTING`, which are events that generally take a clausal complement or an NP headed by an event-denoting nominal. The `SLINK` is established between those events and the one denoted by the complement" (ISO (2008): 67). For each event belonging to the above classes an `SLINK` with its event argument must be created.
- **Structurally-based**:

(i.) **Purpose clauses and complements**: they correspond to the Italian subordinated clause *finale* or complement *di fine/scopo*. The SLINK is created between the event in the main clause and the event in the subordinated clause *finale* or between an event its complement *di fine/scopo*.

(ii.) **Conditional constructions**: in conditional constructions an SLINK is always created between the main clause and the consequent clause, or *se*-clause.

Subordinating relations between events are varied. For the purpose of the annotation scheme 6 of them have been considered as most relevant. Notice that from these relations can be inferred additional (i.e. implicit) temporal links. Possible relations are:

(a.) **Modal**: it refers to the set of all possible things a word or phrase could describe. Intensional subordinating links are created by events which introduce a reference to a possible world:

(68) <EVENT>*Spero*</EVENT> *che tu* <EVENT>*venga*<EVENT>.

The first event ("*spero*") gives rise to a subordination link with the second event ("*venga*"), expressing a reference to a possible world where the participant of the event is able to come. Notice that in Italian intensional relations are marked (normally) by the use of the subjunctive and conditional moods in the subordinate clause. Some instances of intensional relations are coded by the lexical meaning of the event in the main sentence (e.g. "*La polizia ha* ***provato*** *ad* *arrestare* *il ladro*"). Intensional relations holds also between a modal verb and its argument event.

(b.) **Factive**: this relations signals the presupposition or entailment about the veridicity of the event argument or of the event expressed in a subordinated clause:

(69) <EVENT>*Mi spiace*</EVENT> *che tu non* <EVENT>*venga*</EVENT>.

The first event ("*mi spiace*") entails the truthfulness of the second event, i.e. the fact that the participant does not come.

(c.) **Counter-factive**: the inverse of the preceding relation, i.e. the event presupposes the non-veridicity of the second event:

(70) *La polizia ha* <EVENT>*impedito*</EVENT> *una* <EVENT>*manifestazione*</EVENT>.

The first event ("*(ha) impedito*") presupposes the fact that the second event ("*(la) manifestazione*") has not taken place.

(d.) **Conditional**: this relation occurs between any two event in condistionsl constructions i.e. *se* - (*allora*) constructions. Notice in this case the antecedent of the conditional (the *se* clause) takes the place of the introducing event instance (attribute `eventInstanceID`) and the consequent (the main clause) takes the place of the subordinated event (attribute `subordinatedEventInstance`):

(71) *Se* <EVENT>*vieni*<¡/EVENT¿ *ti* <EVENT>*divertirai*</EVENT>.

(e.) **Evidential**: an evidential relation indicates the nature (or the source) of evidence for a given statement. Evidentiality marks the source of information in a statement[5]. In Italian, evidentiality is not a grammatical category (unlike as it is in lots non Indo-european languages, such as Quechua), and it is thus signalled by the use of adverbials ("*a quanto si dice*") or verbs, namely *verba dicendi* or perception verbs.

(72) *Fim-Cisl e Uilm-Uil hanno* <EVENT>*annunciato*</EVENT> per oggi una <EVENT>*conferenza*</EVENT> stampa.

(f.) **Negative evidential**: it is the same as the preceding relation, but the polarity of the evidential statement is negative (non affirmative)

(73) *Il governo croato* <EVENT>*nega*</EVENT> *che siano stati* <EVENT>*espulsi*</EVENT>.

3.3.1 BNF description of `SLINK`

```
attributes ::= [lid] [origin] eventInstanceID [signalID]
                  subordinatedEventInstance relType [syntax]
lid ::= ID
{lid ::= LinkID
LinkID ::= l<integer>}
origin ::= CDATA
eventInstanceID ::= IDREF
{eventInstanceID ::= eventInstanceID}
subordinatedEventInstance ::= IDREF
```

[5]Evidentiality is different from epistemic modality, which marks the speaker's degree of confidence in the propositional content of his/her statement.

```
{subordinatedEventInstance ::= eventInstanceID}
signalID ::= IDREF
{signalID ::= SignalID}
relType ::= MODAL | EVIDENTIAL | NEG_EVIDENTIAL |
              FACTIVE | COUNTER_FACTIVE | CONDITIONAL
syntax ::= CDATA
```

3.3.2 Attributes of SLINK

A. `eventInstanceID` **(Event instance ID)**: obligatory attribute. It conveys the ID of the source from which the slink relations starts.

B. `subordinatedEventInstance` **(Subordinated event instance**: obligatory attribute. It expresses the ID of the subordinated event, i.e. the target of the slink relation.

C. `signalID` **(Signal ID)**: optional attribute. It conveys the ID of the signal which explicitly expresses the subordinating relation between the events.

D. `relType` **(Relation Type)**: obligatory attribute. It expresses the type of subordinating relation between the two events. Its values are: `MODAL`, `EVIDENTIAL`, `NEG_EVIDENTIAL`, `FACTIVE`, `COUNTER_FACTIVE`, `CONDITIONAL`. Details and examples will be provided in section 5.3.

4 How to annotate the markable tags: EVENT, TIMEX3 and SIGNAL

In the following sections we will provide instructions and examples to annotate the markables tags in It-TimeML.

4.1 <EVENT> tag span and attributes' value

It-TimeML, as TimeML and ISO-TimeML, implements a highly surface oriented annotation. As for events, their annotation is based on the notion of *minimal chunk*, because higher constituents may contain more than one event expression. This means that only the head of

the event denoting chunk will be marked up with the tag. Auxiliaries, clitics which are not part of the verb form, polarity markers, particles, modifiers, complements and specifiers will be disregarded. In the following examples the event-denoting chunk is marked with the EVENT tag, while the event phrase is underlined:

(74) *I pompieri hanno* <EVENT>*isolato*</EVENT> *la sala*.

(75) <EVENT>*Accusando*</EVENT>*li di* <EVENT>*omicidio*</EVENT>.

(76) *La* <EVENT>*riunione*</EVENT>
<EVENT>*sta*</EVENT> *per* <EVENT>*chiudersi*</EVENT>.

(77) *Il PIL Italiano*
non è <EVENT>*cresciuto*</EVENT> *nell'ultimo trimestre*.

(78) *La* <EVENT>*caduta*</EVENT> *della base aerea di Ubdina*
<EVENT>*allontana*</EVENT> *il fronte di 120 km*.

(79) *Al Sayed*
<EVENT>*è*</EVENT> *il nuovo* <EVENT>*presidente*</EVENT> *della Fermenta*.

(80) *La coppia, residente a Milano,*
stava <EVENT>*trascorrendo*</EVENT> *un periodo di vacanza in Sicilia.*

4.1.1 Events realized by VERBS

All verbal predicates, including those denoting states, are considered as instances of events and hence will be marked up as such. Only the verbal head is to be annotated. In copular construction the verb "*essere*" must always be annotated.

(81) *I pompieri hanno* <EVENT>*isolato*</EVENT> *la sala.*

(82) <EVENT>*Accusando*</EVENT>*li di omicidio.*

(83) *Il PIL Italiano non è* <EVENT>*cresciuto*</EVENT> *nell'ultimo trimestre.*

As for constructions involving light verbs two separate eventive tags are to be created both the verb and the nominal/prepositional complement. For prepositional complements the general rules for the annotation of events realized by PPs apply (see section4.1.3). The two elements will be linked by means of a `TLINK: identity` (see section 5.1.2).

(84) *fare una domanda.*

<EVENT >fare</EVENT>
una <EVENT >domanda</EVENT>

As for idiomatic expressions realized by complex VPs, only the verb head is to be annotated:

(85) *Tocca a Baker* <EVENT>*tirare*</EVENT> *le somme su questo incontro.*

(86) *Tutte le questioni principali sono* <EVENT>*rimaste*</EVENT> *sul tappeto.*

4.1.2 Event realized by NOUNS

Nouns can be divided into three categories:

- nouns which are never eventive;
- nouns which denote events;
- nouns which can assume an eventive reading due to the co-text of occurrence - this latter class includes dot types of the kind (EVENT • NOT_EVENT) and instances of type coercion.

Only the noun head is to be annotated. Determiners and modifiers are excluded. Nouns are always to be annotated with an event tag in the following cases:

- the noun denotes an event:

  (87) *embargo, guerra, pace, attacco, conflitto, causa...*

- the noun is a complement of an aspectual verb;
- the noun denotes a cause or an effect, or is a complent of a causative predicate;

  (88) *Il fuoco ha distrutto il bosco*

  <EVENT >fuoco</EVENT> ha
  <EVENT >distrutto</EVENT>

  (89) *Le piogge hanno causato la frana.*

  <EVENT >piogge</EVENT> hanno
  <EVENT >causato</EVENT> la
  <EVENT >frana</EVENT>

- the noun is a complement of an inchoative predicate:

(90) *Presto diventeranno dottori di ricerca*

```
<EVENT >diventeranno</EVENT>
<EVENT >dottori</EVENT>
```

(91) *Marco sarà presidente dell'ENI.*

```
<EVENT >sarà</EVENT>
<EVENT >presidente</EVENT>
```

– the noun denotes a sortal state (*presidente*, *dottore*, *amministratore*, *consigliere*...) and it co-occurs with temporal modifiers such as *ex*, *nuovo*, *prossimo* ...

(92) *L'ex amministratore delegato della Fiat*

```
<EVENT >amministratore</EVENT>
```

– it is a deverbal noun in its eventive reading;

– it denotes a set of actions: *congiuntura, consulenze, crisi, edilizia, garanzie, lavori, progetto, prospettive, questione, sinergie*

– when they are followed by a post-modifier which denotes a temporal expression:

(93) *il bilancio del 1991*

```
<EVENT >bilancio</EVENT>
del 1991
```

(94) *L'assemblea dei lavoratori di ieri*

```
<EVENT >assemblea</EVENT>
dei lavoratori di ieri
```

Notice that in case of sequences of complex nominal constructions of the kind "NOUN + DI + NOUN" the annotation of the nominal head of the *di_PP*s strictly depends on the possibility to identify an SLINK between the two noun heads (first noun + second noun). For instance in "il fallimento$_{n1}$ del progetto$_{n2}$ di ristrutturazione$_{n3}$ della casa", the following SLINK hold:

i. n1 *RelatedTo* n2; *SLINK=factive*;

ii. n2 *RelatedTo* n3; *SLINK=modal*

A further class of nouns which can be annotated is represented by the class of *functional nouns*. Functional nouns are nouns like *temperatura*, *popolazione*, *taglia*, *utile*, *intensità*, *aumento*, *crescita*, *quota*, *indice* ... They take an individual as their argument and return a value on a scale, which can be numeric or not (e.g. *high*, *low*, *big* ...).

Whenever a functional noun appears with an associated numeric value or is the argument of a verb which signals a change of its value, the functional noun is to be annotated. Some examples of these contexts are the followings:

- NOUN_functional + E' + NUMBER — DI + NUMBER; e.g.:

  (95) *La popolazione italiana è di 60 milioni di persone.*

  ```
  la <EVENT >popolazione</EVENT>
  <EVENT >è</EVENT>
  di 60 milioni di persone
  ```

  (96) *L'utile è di 30 milioni.*

  ```
  l' <EVENT >utile</EVENT>
  <EVENT >è</EVENT>
  di 30 milioni
  ```

- INDIVIDUAL + HA/HANNO... + NOUN_functional + NUMBER — DI + NUMBER; e.g.:

  (97) *L'Italia ha una popolazione di 60 milioni di persone.*

  ```
  <EVENT >ha</EVENT> una
  <EVENT >popolazione</EVENT>
  di 60 milioni di persone
  ```

- NOUN_functional + INCREMENTATIVE VERBS (*salire, aumentare, scendere, calare, passare, flettere...*) (+ DA NUMBER) (+ A NUMBER) (DI + NUMBER)

  (98) *Il fatturato è passato da 20 a 30 milioni.*

  ```
  il <EVENT >fatturato</EVENT> è
  <EVENT >passato</EVENT> da 20 a 30 milioni
  ```

  (99) *Il fatturato è aumentato del 20%.*

  ```
  il <EVENT >fatturato</EVENT> è
  <EVENT >aumentato</EVENT> del 20%
  ```

  (100) Ha indotto l'indice generale a flettere dell'1%

  ```
  ha <EVENT>indotto</EVENT> l' <EVENT >indice</EVENT>
  generale a <EVENT >flettere</EVENT> dell'1%
  ```

When the grades of the scale are expressed by adjectives the functional nouns has to be marked up as well.
The following special cases have been elaborated by keeping into account the specific TimeML class to which the first noun of such a construction can belong to.

– NOUN_reporting + DI + NOUN; e.g.:

(101) *La dichiarazione del fallimento...*

```
la <EVENT >dichiarazione</EVENT> del
<EVENT >fallmento</EVENT>
```

– NOUN_aspectual + DI + NOUN

(102) *La fine della partita*

```
la <EVENT >fine</EVENT> della
<EVENT >partita</EVENT>
```

– NOUN_perception + DI + NOUN

(103) *La vista dello schianto*

```
la <EVENT >vista</EVENT> dello
<EVENT >schianto</EVENT>
```

(104) *La vista di Mario*

```
la <EVENT >vista</EVENT>
di Mario
```

– Nominalizations of performative verbs + DI + NOUN

(105) *L'ordine di sgombero*

```
l' <EVENT >ordine</EVENT>
di <EVENT >sgombero</EVENT>
```

– DEVERBAL NOUN + DI + FUNCTIONAL NOUN + (DI +) NUMBER

(106) *L'aumento della temperatura di 3 gradi*

```
l' <EVENT >aumento</EVENT>
della <EVENT >temperatura</EVENT> di 3 gradi
```

(107) *La registrazione di un utile del 30%*

```
la <EVENT >registrazione</EVENT>
di un <EVENT >utile</EVENT> del 30%
```

As for idiomatic expressions realized by noun + adjective, only the noun is marked up; e.g.:

(108) *disco verde.*

```
<EVENT>disco</EVENT> verde
```

(109) *via libera*

```
<EVENT>via</EVENT> libera
```

4.1.3 Events realized by PPs

When events are realized by prepositional phrases, only the head of the PP is to be marked.

(110) *I passeggeri a bordo del volo Oceanic 815.*

```
i passeggeri <EVENT>a</EVENT>
bordo del volo...
```

The head preposition is marked as eventive only if the verb, noun or adjective within the PP does not denote an event itself and if the PP is functioning as a predicative complement; e.g.:

(111) *Senza persare se ne andò.*

```
senza <EVENT >pensare</EVENT>
```

(112) *Lo show è iniziato con un'intervista al presidente*

```
con un' <EVENT >intervista</EVENT>
```

4.1.4 Events realized by ADJECTIVES

There are two types of adjectives: attributives and predicatives. Only adjectives in predicative positions are annotated as events. Notice that the property denoted by the adjective must be non-persitent and fit into one of the following cases:

- the property the adjective denotes is clearly non-persistent, fluid; e.g.

  (113) *Nick diventò rosso per la vergogna.*

  ```
  <EVENT >diventò</EVENT>
  <EVENT >rosso</EVENT> per la
  <EVENT >vergogna</EVENT>
  ```

- the property the adjective denotes is presented as temporally bounded to a particular point or period of time; e.g.:

  (114) *Parte del nord Italia era sottosviluppato fino al XIX° secolo.*

  ```
  <EVENT >era</EVENT>
  <EVENT >sottosviluppato</EVENT>
  ```

– the property the adjective denotes is presented as the opinion, knowledge, belief of somebody; e.g.:

(115) *Si ritiene furbo.*

```
<EVENT >ritiene</EVENT>
<EVENT >furbo</EVENT>
```

NOTE: in case of doubt DO NOT annotate the adjective.

4.1.5 Other elements

Under this class are annotated locative expressions like *qui*, *là*, *lì* and similar when complement of copular constructions.

4.1.6 Copula construction with the verb "*essere*"

In TimeML copular constructions realized by "*essere*" + NP or AdjP, or PP or AdvP are considered as instances of VPs. This means that the verb "*essere*" must aways be marked up. All the elements forming the copular constructions (verb, NP, AdjP, AdvP) are to be marked up following the rules stated in the previous sections.

4.1.7 Annotation of modal verbs

Modal verbs in Romance languages are very different from the English ones. In Italian, modal verbs are to be considered similar to other lexical verbs in that it is possible to assign them values for tense and aspect. Consequently, each instance of Italian modal verbs ("*dovere*", "*potere*", "*volere*") will be annotated with the tag `<EVENT>`. In addition to this, all modal verbs will be **always** assigned to the class `I_STATE`. When annotating a modal verb the attribute `modality` must be filled in:

(116) *L'assemblea deve prendere una decisione.*

```
<EVENT ... class="I_STATE" tense="PRESENT"
aspect="IMPERFECTIVE" modality="DOVERE">deve</EVENT>
<EVENT ... tense="NONE" aspect="NONE"
vForm="INFINITIVE" class="OCCURRENCE">prendere</EVENT>
una
<EVENT ... tense="NONE" aspect="NONE"
class="OCCURRENCE">decisione</EVENT>
```

(117) *Non ho potuto chiamare l'ufficio cambi.*

```
<EVENT ... class="I_STATE" tense="PRESENT"
aspect="PERFECTIVE" modality="POTERE">potuto</EVENT>
<EVENT ... tense="NONE" aspect="NONE"
vForm="INFINITIVE" class="OCCURRENCE">chiamare</EVENT>
```

4.1.8 Annotation of verbal periphrases

In Italian it is possible to identify different instances of verbal periphrases. We accept here the proposal of Bertinetto (1991) to identify a hierarchy of verbal periphrases:

(a.) aspectual periphrases which code progressive or habitual aspect:

(118) *sta mangiando.*

(119) *è solito riposare.*

(b.) modal periphrases which code modality not realized by proper modal verbs:

(120) *essere in grado di + INFINITIVE.*

(121) *c'è da + INFINITIVE.*

(122) *andare + INIFINITIVE (va fatto).*

(123) *avere da + INFINITIVE.*

(c.) phasal (aspectual) periphrases which code information on a particular phase (or aspect) in the description of a particular event, corresponding to those verbs classified as `ASPECTUAL` events (see point D section 2.2.2 `class`: ASPECTUAL)

Following Bertinetto (1991), we claim that only in the last two cases, i.e. modal periphrases and phasal (aspectual) periphrases, both elements involved should be annotated, while in the case of the aspectual periphrasis the aspectual verb and its event argument are to be annotated separately by means of two distinct `EVENT` tags. The value of the attribute `modality` for modal periphrases is represented by the periphrasis itself. Finally, it is important to point out that phasal periphrases always give rise to an `ALINK`, whose value is dependent on the meaning of the phasal/aspectual verb, while modal periphrases always give rise to an `SLINK`, whose value is `MODAL` :

(124) *La borsa stava perdendo l'1,1% in prima mattinata.*
(Progressive periphrasis)

```
<EVENT class="OCCURRENCE">perdendo</EVENT>
```

(125) *A oggi siamo in grado di dire che l'accordo non è stato raggiunto.* (Modal periphrasis)

```
<EVENT class="I_STATE"
modality="IN_GRADO_DI">siamo</EVENT>
<EVENT class="I_STATE"
modality="IN_GRADO_DI">in grado di</EVENT>
di
<EVENT class="REPORTING">dire</EVENT>
```

(126) *C'è da dire che questo trattamento non è soddisfacente.* (Modal periphrasis)

```
c'
<EVENT class="I_STATE" modality="ESSERCI_DA">è</EVENT>
da
<EVENT class="REPORTING">dire</EVENT>
```

(127) *Il magistrato ha iniziato a condurre le indagini sulla mortedi Calipari.*(Phasal/Aspectual periphrasis)

```
<EVENT class="ASPECTUAL">iniziato</EVENT>
a
<EVENT class="I_ACTION">condurre</EVENT>
```

4.1.9 Event Instance

Events denoting expressions may refer to more than one instance of the event, i.e. the event may be occurred more than once. Consider this example:

(128) *Marco ha **insegnato** martedì e mercoledì.*

The event (in bold in the example) has two different instances, one which occurred "*martedì*" and the other "*giovedì*". In these cases, in order to perform good TimeML link annotations an event instance must be created.

4.1.10 Annotation of `tense` and `aspect`

In this section we present the values and rules for annotating `tense` and `aspect` in Italian. Assignment of more than one value for `aspect`

is due to the fact that the same tense can have more than one aspectual value according to co-textual and con-textual factors.

1. Events realized by finite verb forms:
   - tense= "PRESENT"
     - *gioca* aspect= IMPERFECTIVE mood= NONE
     - *sta giocando* aspect= PROGRESSIVE mood= NONE
     - *ha mangiato* aspect= PERFECTIVE mood= NONE
     - *é mangiato* aspect = IMPERFECTIVE mood= NONE
     - *(che) mangi* aspect= IMPERFECTIVE mood = SUBJUNCTIVE
   - tense= "PAST"
     - *giocò* aspect= PERFECTIVE mood= NONE
     - *ebbe l'abitudine di giocare* aspect= PERFECTIVE mood= NONE
     - *fu mangiato* aspect= PERFECTIVE mood= NONE
     - *è stato mangiato* aspect= PERFECTIVE mood= NONE
     - *(che) abbia mangiato* aspect= PERFECTIVE mood = SUBJUNCTIVE
     - *aveva giocato* aspect= PERFECTIVE mood= NONE
     - *ebbe giocato* aspect= PERFECTIVE mood= NONE
     - *era stata mangiata* aspect= PERFECTIVE mood= NONE
     - *(che) avesse mangiato* aspect= PERFECTIVE mood = SUBJUNCTIVE
     - *giocava* aspect= IMPERFECTIVE mood= NONE
     - *stava giocando* aspect= PROGRESSIVE mood= NONE
     - *aveva l'abitudine di giocare* aspect= IMPERFECTIVE mood= NONE
     - *era mangiata* aspect= IMPERFECTIVE mood= NONE
     - *(che) mangiasse* aspect= IMPERFECTIVE mood = SUBJUNCTIVE
   - tense= "FUTURE"
     - *giocherà* aspect= PERFECTIVE mood= NONE
     - *avrà giocato* aspect= PERFECTIVE mood= NONE
     - *sarà mangiata* aspect= PERFECTIVE mood= NONE
     - *starà mangiado* aspect= PROGRESSIVE mood= NONE

- tense= "NONE"
  - *mangerebbe* aspect= IMPERFECTIVE mood= CONDITIONAL
  - *sarebbe mangiato* aspect= IMPERFECTIVE mood= CONDITIONAL
  - *avrebbe mangiato* aspect= PERFECTIVE mood= CONDITIONAL
  - *sarebbe stato mangiato* aspect= PERFECTIVE mood= CONDITIONAL
  - *starebbe mangiando* aspect= PROGRESSIVE mood= CONDITIONAL
- tense= "NONE"
  - *mangia* aspect= NONE mood= IMPERATIVE

2. Events realized by non-finite verb forms:
   - tense= "NONE" vform="INFINITIVE" mood= NONE
     - *giocare* aspect= NONE
     - *aver giocato* aspect= PERFECTIVE
     - *stare giocando* aspect= PROGRESSIVE
   - tense= "NONE" vform="GERUND" mood= NONE
     - *giocando* aspect= NONE
     - *avendo giocato* aspect= PERFECTIVE
   - tense= "NONE" vform="PARTICIPLE" mood= NONE
     - *giocante* aspect= NONE
     - *giocato* aspect= PERFECTIVE

   Non-finite verb forms do not have automonous temporal reference.

3. Events realized by adjectives or nouns:
   - tense= "NONE"
   - aspect= "NONE"
     - *La coppia, residente a Milano, era in vacanza.*
     - *I lavoratori chiedono nuove trattative.*

For events realized by prepositional phrases, the values for tense and aspect are the same as for those for nouns.

4.1.11 What NOT to tag

There are situations in which entities which may be eligible to be annotated as events should not be tagged:

(a.) When the event reading of a logically polysemous noun is not exploited in the verb predication, or, when the verb arguments do not require an eventive noun. The identification of an eventive reading of a noun, and thus its annotation, is licenced by a combination of these elements:

* the semantic types of a verb argument. Every verb has a set of valency features which corresponds both to the number of its arguments and also to their semantic types. For instance, the class of `ASPECTUAL` events, when realized by verbs, take as one of its arguments (either in the direct object position or in the subject position, according to the construction) an event. However, in natural language, it is quite common to find nouns which do not have an eventive reading in isolation but acquire it when they are arguments of these kinds of verbs:

  (129) *Marco ha iniziato a leggere un libro.*

  ```
  <EVENT class="ASPECTUAL" tense="PRESENT"
  aspect="PERFECTIVE">iniziato</EVENT>
  a
  <EVENT class="OCCURRENCE" vForm="INFINITIVE"
  tense="NONE" aspect="NONE">leggere</EVENT>
  ```

  (130) *Marco ha iniziato il libro.*

  ```
  <EVENT class="ASPECTUAL" tense="PRESENT"
  aspect="PERFECTIVE">iniziato</EVENT>
  il
  <EVENT class="OCCURRENCE" tense="NONE"
   aspect="NONE">libro</EVENT>
  ```

* the semantic type (or types) of the noun itself. Following the G.L. approach (Pustejovsky, 1995) to lexical semantics, we claim that every noun realizes one or more semantic types, corresponding to lexical ontological classes. For instance, the noun "*mela*" realizes the semantic type `Food` (or the more general, `Physical_object`), the noun "*caduta*" realizes the semantic type `Event`, while the noun "*libro*" realizes two semantic types `Physical_object` and `Information`[6] at the same

[6]Nouns like "*libro*" are classified as *dot objects* in G.L. Theory.

time, i.e. they are inherently polysemous. This latter type of nouns realizes its semantics type according to the verb arguments' selection. To clarify, consider this example with the noun "*assemblea*" which, in isolation, is associated with two semantic types: (`Human_group` ⊗ `Event`):

(131) *L'assemblea ha deliberato il bilancio '92.*

deliberare selects *assemblea* = `Human_group`

(132) *L'assemblea è stata rinviata.*

rinviare selects *assemblea* = `Event`

Only the instance in the example 132, the noun "*assemblea*" must be tagged with `EVENT`.

Being aware of the possible semantic types associated with each noun and the verb arguments' selection is essential to identify event instances.

4.2 <TIMEX3>: tag span and attributes value

4.2.1 Tag span

The surface-oriented approach to the tagging of expressions in ISO-TimeML implies that temporal expression annotation is based on the constituent structure and the time unit classification presented in Table 3. The criteria for the identification the tag span can be grammatical or relational. Relation criteria are more salient than grammatical ones.

Table 3: *Time units classification.*

t<**day**	**day**≤t≤ **month**	**month**≤t≤ **year**	*t* >**year**
alba	*domani*	*estate*	*lustro*
mezzogiorno	*fine settimana*	*semestre*	*secolo*
notte	*giornata*	*anno*	*biennio*
hh:mm:ss	*domani*	*1984*	
minuto	*il primo di dicembre*	*Febbraio*	
	martedì		

4.2.2 Grammatical criteria

The span of the tag must correspond to one of the following categories:

- **Noun Phrase**: *lunedì, mese, la scorsa estate...*

- **Adjectival Phrase** *annuale, estivo, mensile, quotidiano...*
- **Adverbial Phrase** *oggi, ieri, finora, lì, qui,...*
- **Time/Date Patterns**: *31-12-2006, 14.30, 24/08 ...*

The spatial adverbs "*qui*" and"*lì*" are considerd temporal expression triggers only in range expressions:

(133) *da qui a dicembre.*

```
da
<TIMEX3>qui</TIMEX3>
a
<TIMEX3>dicembre</TIMEX3>
```

All prepositions, including contracted prepositions, and subordinating conjunctions introducing a temporal expression are not to be considered part of the timex tag. This is due to the fact that relevant temporal prepositions, and other signals of temporal relations, are marked with the `SIGNAL` tag:

(134) *nel pomeriggio.*

```
nel
<TIMEX3>pomeriggio</TIMEX3>
```

(135) *per l'autunno.*

```
per
<TIMEX3>l'autunno</TIMEX3>
```

Exceptions are represented by the prepositions "*circa*", "*intorno a*" and "*verso*" which must be included into the extent of the tag because they have a role in the normalization of the timex:

(136) *per circa un mese.*

```
per
<TIMEX3>circa un mese<TIMEX3>
```

(137) *verso le 10 di sera.*

```
<TIMEX3>verso le 10 di sera<TIMEX3>
```

Similarly, clock times expressed by more than one temporal expression trigger and preposition must be marked up in a single tag:

(138) *per circa un mese.*

```
per
<TIMEX3>circa un mese<TIMEX3>
```

(139) *manca 10 alle 3.*

```
manca<TIMEX3>10 alle 3<TIMEX3>
```

Further exceptions are represented by multiwords like *per ora*, *dopo domani*, *fin'ora*, *di recente* and similar where the whole expression is considered as a single unit and so the preposition is included into the tag:

(140) *per ora.*

```
<TIMEX3>per ora<TIMEX3>
```

(141) *dopo domani.*

```
<TIMEX3>dopo domani<TIMEX3>
```

(142) *fin'ora.*

```
<TIMEX3>fin'ora<TIMEX3>
```

(143) *poco fa.*

```
<TIMEX3>poco fa<TIMEX3>
```

All pre- and post-modifiers of a temporal expression must be included into the tag, with the exception of postmodifiers denoting an event:

(144) *durante lo scorso trimestre.*

```
durante
<TIMEX3>lo scorso trimestre</TIMEX3>
```

(145) *il mese scorso.*

```
<TIMEX3>il mese scorso</TIMEX3>
```

(146) *nel secondo semestre.*

```
nel
<TIMEX3>secondo semestre</TIMEX3>
```

(147) *tre giorni fa.*

```
<TIMEX3>tre giorni fa</TIMEX3>
```

(148) *il giorno della partenza.*

```
<TIMEX3>il giorno</TIMEX3>
della partenza
```

(149) *appena tre giorni fa.*

```
<TIMEX3>appena tre giorni fa</TIMEX3>
```

The word "*dopo*" must be included into the tag span only when it has the function of adjective, otherwise it is to be excluded:

(150) *dopo tre giorni.*

```
dopo
<TIMEX3>tre giorni</TIMEX3>
```

(151) *tre giorni dopo.*

```
<TIMEX3>tre giorni dopo</TIMEX3>
```

(152) *tre giorni dopo Natale.*

```
<TIMEX3>tre giorni</TIMEX3>
dopo
<TIMEX3>Natale</TIMEX3>
```

If the postmodifiers is realized by one of the following items, i.e. "*esaminato*", "*in esame*", "*in analisi*", "*analizzato*", "*preso in esame*", " *considerato*", "*a questa parte*", "*in corso*" and similar, the postmodifier has to be included into the timex extent since it is essential for its normalization. Relative clauses realized as "*che rimane / che rimangono*" (i.e. "*rimanente/i*") and "*che segue / che seguono*" (i.e. "*seguente/i*") are to be included into the `TIMEX3` tag extent.

If a temporal trigger words is preceeded by the expression "*ciò/quel che resta/rimane + di/del +* timex_trigger" it is to be included into the `TIMEX3` tag.

Further modifiers (both in premodifier position and postmodifier position) to be included into the `TIMEX3` tag to ease normalization are "*in/di ritardo*" (i.e. "*dopo*") and "*in/di anticipo*" (i.e. "*prima*").

Appositives are considered as post-modifiers, and thus are included into the tag span. However, if the appositives contains a lexical trigger for timexes we have two separate expressions:

(153) *gli anni '60, gli anni del libero amore.*

```
<TIMEX3>gli anni '60</TIMEX3>
<TIMEX3>gli anni del libero amore</TIMEX3>
```

Conjoined temporal expressions can be marked either in two separate tags or in a single one. The following rules apply:

- if the two temporal expressions refer to two independent point or intervals of time, then two distincts tags must be created;

  (154) *nel 2005 e nel 2006.*

  ```
  nel
  <TIMEX3>2005</TIMEX3>
  e nel
  <TIMEX3>2006</TIMEX3>
  ```

  (155) *6 o 7 giorni.*

  ```
  <TIMEX3>6</TIMEX3>
  o
  <TIMEX3>7 giorni</TIMEX3>
  ```

- if the two temporal expressions denote a clock time, then a single tag must be created;

  (156) *alle 13 e 56.*

  ```
  alle
  <TIMEX3>13 e 56</TIMEX3>
  ```

- if the temporal expressions denote durations and the conjunction is expressing a specification relation between the temporal expressions, then one single tag must be created;

  (157) *3 anni, 6 mesi e un giorno.*

  ```
  <TIMEX3>3 anni, 6 mesi e un giorno</TIMEX3>
  ```

Two consecutive temporal expressions are marked up into a single tag when they belong to the same syntactic constituent and specify a unique time value, otherwise two different tags must be created:

(158) *la mattina del 20 giugno.*

```
<TIMEX3>la mattina del 20 giugno</TIMEX3>
```

(159) *ottobre del 1963*

```
<TIMEX3>ottobre del 1963</TIMEX3>
```

(160) *alle 11 di ieri mattina*

```
alle
<TIMEX3>11 di ieri mattina</TIMEX3>
```

(161) *i primi mesi dell'anno*

```
<TIMEX3>i primi mesi dell'anno</TIMEX3>
```

(162) *il primo trimestre dell'anno*

```
<TIMEX3>il primo trimestre dell'anno</TIMEX3>
```

(163) *venerdì sera alle 20.00.*

```
<TIMEX3>venerdì sera</TIMEX3>
alle
<TIMEX3>20.00</TIMEX3>
```

(164) *ieri alle 11.00.*

```
<TIMEX3>ieri</TIMEX3>
alle
<TIMEX3>11.00<TIMEX3>
```

(165) *due settimane a ottobre*

```
<TIMEX3>due settimane</TIMEX3>
a
<TIMEX3>ottobre<TIMEX3>
```

Temporal expressions like "*i primi 5 giorni della settimana*" do not express a unique temporal value but two, notwithstanding the presence of the preposition "*della*" and the fact that the temporal expression belong to the same syntactic constituent (i.e. a complex NP; see section 4.2.3 point (ii.) for further details).

(166) *i primi 5 giorni della settimana*

```
<TIMEX3>i primi 5 giorni</TIMEX3>
della
<TIMEX3>settimana</TIMEX3>
```

We accept the extensions proposed in Lavelli et al. (2005) to be marked into a single `TIMEX3` tag:

(167) *ore e ore.*

```
<TIMEX3>ore e ore</TIMEX3>
```

(168) *di giorno in giorno.*

```
di
<TIMEX3>giorno in giorno</TIMEX3>
```

(169) *giorno dopo giorno.*

```
<TIMEX3>giorno dopo giorno</TIMEX3>
```

(170) *24 ore su 24.*

```
<TIMEX3>24 ore su 24</TIMEX3>
```

(171) *anno dopo anno.*

```
<TIMEX3>anno dopo anno</TIMEX3>
```

Further extentions are the following:

(172) *al momento.*

```
<TIMEX3>al momento</TIMEX3>
```

(173) *per il momento.*

```
<TIMEX3>per il momento</TIMEX3>
```

(174) *poco fa.*

```
<TIMEX3>poco fa</TIMEX3>
```

Temporal expressions which differs from the standard Gregorian calendar are to be annotated as illustrated below:

(175) *l'anno scolastico 2008/2009.*

```
<TIMEX3>l'anno scolastico 2008/2009</TIMEX3>
```

(176) *l'anno fiscale '92 - '93.*

```
<TIMEX3>l'anno fiscale '92 - '93</TIMEX3>
```

The adjectives and adverbs in Table 4 are instances of temporal expression trigger words and thus must always be annotated:

Table 4: *Special adjectival and adverbial triggers.*

Token	**POS**
ex, recente, attuale corrente	Adjective
passato, presente, futuro	Adjective
recentemente, di recente, attualmente	Adverb

Notice that the tokens "*presente/passato/futuro*" are considered as instances of temporal expressions only when they are adjectives or complement of a PP. In case they are nouns, they are never marked up as temporal expressions.

4.2.3 Relational Criteria

According to the type of relation which exists between two consecutive temporal expressions, different rules apply for the tag span. In these cases:

- the temporal expressions will be marked up in a single tag if:
  (i.) the two expressions belong to the same temporal unit, as illustrated in Table 3 on page 41, or if they are hierarchically related:
  (177) *venerdì sera.*
  `<TIMEX3>venerdì sera</TIMEX3>`
  (178) *venerdì ore 11.*
  `<TIMEX3>venerdì ore 11</TIMEX3>`
  (179) *martedì 26 giugno*
  `<TIMEX3>martedì 26 giugno</TIMEX3>`
  (180) *giugno 1969.*
  `<TIMEX3>giugno 1969</TIMEX3>`
- Two tags must be created:
  (i.) when two temporal expressions are in an anchoring relation:
  (181) *venerdì sera alle 20.00.*
  ```
  <TIMEX3>venerdì sera</TIMEX3>
  alle
  <TIMEX3>20.00</TIMEX3>
  ```
  (182) *due settimane da oggi*
  ```
  <TIMEX3>due settimane</TIMEX3>
  da
  <TIMEX3>oggi</TIMEX3>
  ```
  (183) *tre giorni prima di ieri*
  ```
  <TIMEX3>tre giorni</TIMEX3>
  prima di
  <TIMEX3>ieri</TIMEX3>
  ```
  (184) *il terremoto è avvenuto un anno fa oggi.*
  ```
  il terremoto è avvenuto
  <TIMEX3>un anno fa</TIMEX3>
  <TIMEX3>oggi</TIMEX3>
  ```
  (ii.) when they give rise to *framed durations*: the temporal expression contains a date (in bold) and a duaration (underlined). In these cases to assign a unique date or time value nor a unique duration, thus two tags are created

(185) *i primi 6 mesi dell'**anno***

```
<TIMEX3>i primi 6 mesi</TIMEX3>
dell'
<TIMEX3>anno</TIMEX3>
```

(186) *i primi dieci anni del **XX° secolo***

```
<TIMEX3>i primi dieci anni</TIMEX3>
del
<TIMEX3>XX° secolo</TIMEX3>
```

*le due ultime settimane del **mese***

```
<TIMEX3>le ultime due settimane</TIMEX3>
del
<TIMEX3>mese</TIMEX3>
```

4.2.4 What NOT to tag

Among non markable time expressions, together with those expressions which can have a temporal meaning but are not considered trigger words, we include (all non markable elements are in bold):

- Frequency expressions, when no time period is given:

  (187) *L' Italia è diventata campione del mondo per **quattro volte**.*

  (188) *I gestori si sono mostrati **spesso** inclini alla cautela.*

- Sequencing and ordering expressions:

  (189) *Le perizie erano state **inizialmente** predisposte dal presidente.*

- Manner adverbs:

  (190) *La vendita sarà annunciata a Roma e a Londra **contemporaneamente**.*

  (191) ***Subito** soccorsa dai medici presenti nel villaggio.*

- Non-quantifiable durations:

  (192) *Un investimento da liquidare **a breve termine**.*

  (193) *Attendevano **da tempo** lo sblocco delle certificazioni.*

- Proper names that contain or comprise a time expression but denote named entities or similar:

  (194) **Settembre Nero**.

  (195) *Domani aprirà la mostra "**Il secolo** breve".*

  (196) *"**1984**" è un libro di George Orwell.*

4.2.5 Annotation of `value`: expressing the meaning of temporal expressions

The `value` attribute expresses the meaning of a temporal expression. Its annotation is strictly dependant upon the `type` value assigned to the temporal expressions. As a general rule, all temporal expressions should be given the following ISO format for dates (already presented in section 2.3 on page 13): `YYYY-MM-[WW]-DDThh:mm:ss`, that is Year, Month, Week (optional), Day, Hour, Minute and Second. However, natural language temporal expressions cannot always be reconducted to such forms, so some extensions have been introduced.

A. `DATE`: they must always be reconducted to the format `YYYY-MM-[WW]-DD`:

(197) *venerdì due dicembre 2008.*

```
<TIMEX3 type="DATE" value="2008-12-02">
venerdì due dicembre 2008
</TIMEX3>
```

07/08/1995

```
<TIMEX3 type="DATE" value="1995-08-07">
07/08/1995
</TIMEX3>
```

The annotator will introduce as much information as is available both in the time expression and from the context. In case the text would include some reference to the specific date in which the time is anchored the annotator has to resolve it and assign the most specific value. Assuming that all the temporal expressions in the following examples have as anchor this date "*venerdì 28 Novembre 2008*", we will obtain:

(198) *il 3 aprile prossimo.*

```
<TIMEX3 type="DATE" value="2009-04-03">
il 3 aprile prossimo
</TIMEX3>
```

(199) *lo scorso 15 maggio*

```
<TIMEX3 type="DATE" value="2008-05-15">
lo scorso 15 maggio
</TIMEX3>
```

(200) *ieri*

```
<TIMEX3 type="DATE" value="2008-11-27">
ieri
</TIMEX3>
```

(201) *il 25/12*

```
<TIMEX3 type="DATE" value="2008-12-25">
il 25/12
</TIMEX3>
```

Weeks are assigned the position of Months in the date format and their value corresponds to the week number in the calendar of the corresponding year:

(202) *questa settimana* (referring to the week from 24-30 November 2008)

```
<TIMEX3 type="DATE" value="2008-W49">
questa settimana
</TIMEX3>
```

If some information cannot be recovered from the context, then the missing information must be signalled using the placeholders `X`

(203) *il 1980*

```
<TIMEX3 type="DATE" value="1980-XX-XX">
il 1980
</TIMEX3>
```

(204) *ad agosto*

```
ad
<TIMEX3 type="DATE" value="XXXX-08-XX">
agosto
</TIMEX3>
```

Temporal expressions which differs from the standard Gregorian calendar are to be normalized as follows (see also Ferro et al. (2005)):

- they are considered `DATE`;
- in presence of the modifier "*fiscale*" they will always receive a normalize value by exploiting the symbol `FY`:

  (205) *l'anno fiscale 2008*

  ```
  <TIMEX3 type="DATE" value="FY2008">
  l'anno fiscale 2008
  </TIMEX3>
  ```

l'anno fiscale '92 - '93

```
<TIMEX3 type="DATE" value="FY1992">
l'anno fiscale '92 - '93
</TIMEX3>
```

- in presence of modifiers other than "*fiscale*", they will remain underspecified for the normalized value:

(206) *l'anno scolastico 2008/2009*

```
<TIMEX3 type="DATE" value="XXXX-XX-XX">
l'anno scolastico 2008/2009
</TIMEX3>
```

la stagione calcistica '92 - '93

```
<TIMEX3 type="DATE" value="XXXX-XX-XX">
la stagione calcistica '92 - '93
</TIMEX3>
```

Following the extension proposed in TIDES, in Table 5, we present some markable expressions which are classified as `DATE` but whose values cannot be reconducted to the standard ISO representation:

Notice that the symbols for "*semestre*", "*trimestre*", "*quadrimestre*" and "*bimestre*" always co-occur with ordinal numbers from 1 up to a maximum of 6, and corresponds to the cardinal modifiers "*primo*", "*secondo*" etc.. Thus, "*il terzo trimestre*" will receive `value=XXXX-Q3`, "*il secondo semestre*" will have `value="XXXX-H2"` and so on for the others. These four temporal expressions are assigned value `DATE` if and only if they co-occur with the cardinal modifiers because they denote a fixed set of months, e.g. "*il terzo trimestre*" corresponds to the months of "*luglio - agosto - settembre*". If they do not co-occur with these modifiers or they refer to different set of months, then they are followed by an X.

(207) *il trimestre febbraio - aprile*

```
<TIMEX3 value="2008-QX">il trimestre</TIMEX3>
<TIMEX3>febbraio</TIMEX3>
<TIMEX3>marzo</TIMEX3>
```

Moreover, these special normalization symbols can be used only in presence of the correspondig trigger words and in combination with the modifier "*metà*" as illustrated in Table 8.

B. `TIME`: all temporal expression which corresponds to the value `TIME` will begin with a 'T' (Time). The value are assigned on a 24 hour base (e.g. 4 p.m. = 16:00):

Table 5: *Special* `DATE` *markables and value.*

Temporal Expression	`value`	**Annotation sample**
al momento, per il momento, in questi giorni, tuttora, per ora, nel presente, a oggi, adesso, attuale	PRESENT_REF	`value="PRESENT_REF"`
recentemente, in passato, tempo fa, poco fa, ex, passato	PAST_REF	`value="PAST_REF"`
al/in futuro, il domani (generic reference) futuro	FUTURE_REF	`value="FUTURE_REF"`
autunno, autunnale	FA	`value="XXXX-FA"`
primavera, primaverile	SP	`value="XXXX-SP"`
estate, estivo	SU	`value="XXXX-SU"`
inverno, invernale	WI	`value="XXXX-WI"`
fine settimana, week-end	WE	`value="XXXX-XX-WE"`
semestre	H	`value="XXXX-H1"`
trimestre	Q	`value="XXXX-Q1"`
quadrimestre	Qu	`value="XXXX-Qu1"`
bimestre	B	`value="XXXX-B1"`

(208) *le 16.00*

```
<TIMEX3 type="TIME" value="T16:00">
le 16.00
</TIMEX3>
```

In case the text would include some reference to a specific date in which the time is anchored, then the date must be contained in the value attribute:

(209) *ieri alle 16.00*

```
<TIMEX3 type="DATE" value="2008-11-27">
ieri
</TIMEX3>
alle
<TIMEX3 type="TIME" value="2008-11-27T16:00">
16.00
```

</TIMEX3>

As for DATE, TIME presents some extensions as well. In Table 6, we present some markable expressions which are classified as TIME but whose values cannot be reconducted to the standard ISO representation, namely Thh:mm:ss:

Table 6: *Special TIME markables and value.*

Temporal Expression	value	**Annotation sample**
mattina	MO	value="XXXX-XX-XXTMO"
mezzogiorno, mezzodì	MI	value="XXXX-XX-XXTMI"
pomeriggio	AF	value="XXXX-XX-XXTAF"
sera, serata	EV	value="XXXX-XX-XXTEV"
notte, nottata	NI	value="XXXX-XX-XXTNI"
giorno (day time or working hours)	DT	value="XXXX-XX-XXTDT"

C. DURATION: these temporal expressions denote intervals of time. All durations' value begins with a 'P' (Period of time). If the interval denoted by the duration can be determined by reasoning due to the presence of beginning and ending points, or if it is explicitly stated in the expression, then it is represented by an ordinal number; otherwise the placeholder X must be employed. The granularity value (Year, Month, ...) of the duration must always be expressed :

(210) *4 mesi*

```
<TIMEX3 type="DURATION" value="P4M">
4 mesi
</TIMEX>
```

(211) *per 45 minuti.*

```
per
<TIMEX3 type="DURATION" value="P45TM">
45 minuti
</TIMEX3>
```

(212) *alcuni anni fa*

```
<TIMEX3 type="DURATION" value="PXY">
alcuni anni fa
</TIMEX3>
```

(213) *due mesi, tre giorni e cinque ore.*

```
<TIMEX3 id="t1" type="DURATION" value="P2M3DT5H">
due mesi, tre giorni e cinque ore
</TIMEX3>
```

D. `SET`: To fully annotate sets, the `TIMEX3` can include either the `quant` or `freq` attributes, if not both. The `quant` and `freq` attributes are fulfilled only in presece of specific expressions realizing them, they cannot be inferred. The following examples present the annotation of `TIMEX3` `SET` for the `value` attribute (for the annotation of `quant` and `freq` see section 2.3 point H):

(214) *una volta a settimana.*

```
<TIMEX3 type="SET" value="P1W" freq="1X">
una volta a settimana
</TIMEX3>.
```

(215) *ogni tre giorni.*

```
<TIMEX3 type="SET" value="P3D" freq="3D" quant="ogni">
ogni tre giorni
</TIMEX3>
```

(216) *ogni ottobre.*

```
<TIMEX3 type="SET" value="XXXX-10" quant="ogni">
ogni ottobre
</TIMEX3>
```

(217) *3 giorni a settimana.*

```
<TIMEX3 type="SET" value="P1W" freq="3D">
3 giorni a settimana
</TIMEX3>
```

(218) *tutti i martedì.*

```
<TIMEX3 type="SET" value="XXXX-WXX-02" quant="tutto">
tutti i martedì
</TIMEX3>
```

4.2.6 Annotation of `mod`

The `mod` attribute signals the presence of modifiers which code a vague quantification over the temporal expressions. They are marked with the attribute `mod` and as illustrated before they are part of the `TIMEX3` tag. In the Table 7 we will present the linguistic expressions which fit into the attribute `mod` and their corresponding values:

(219) *mancano meno di due giorni alla consegna.*

```
<TIMEX3 type="DURATION" value="P2D" mod="LESS_THAN">
meno di 2 giorni
</TIMEX3>.
<TIMEX3 type="DATE" value="2008-12-04" mod="BEFORE"/>
```

(220) *ha svolto il suo mandato meno di un decennio fa e oggi si è ritirato a vita privata.*

```
<TIMEX3 type="DURATION" value="P10Y" mod="LESS_THAN">
meno di un decennio fa
</TIMEX3>
```

Table 7: *Modifier expressions and values.*

Modifier	**Value of** `mod`	**Usage**
più di	BEFORE	**points**
meno di	AFTER	**points**
non meno di	ON_OR_BEFORE	**points**
non più di	ON_OR_AFTER	**points**
meno di appena	LESS_THAN	**duration**
più di oltre	MORE_THAN	**duration**
non più di al massimo	EQUAL_OR_LESS	**duration**
almeno	EQUAL_OR_MORE	**duration**
l'inizio di/del i primi di l'alba di/del	START	**both**
metà	MID	**both**
la fine di/del tardo ultimi	END	**both**
circa verso intorno a un paio di una decina di (and similar)	APPROX	**both**

```
e
<TIMEX3 type="DATE" value="2008-12-02">oggi</TIMEX3>
<TIMEX3 type="DATE" value="1998" mod="BEFORE"/>
```

(221) *una decina di anni fa.*

```
<TIMEX3 type="DURATION" value="P10Y" mod="APPROX">
una decina di anni fa
</TIMEX3>
```

(222) *a metà pomeriggio.*

```
a
<TIMEX3 type="DATE" value="2008-11-28TAF" mod="MID">
metà pomeriggio
</TIMEX3>
```

The modifier "*metà*" may vary its role on the basis of (i.) the granularity of the temporal expressions which modifies and (ii) the co-occurrence with ordinal adjectives such as "*prima*" and "*seconda*". In Table 8 we illustrate in details how to normalize timexes with this modifier:

Table 8: *Values of the modifier metà.*

Timex Sample	**Granularity**	**Annotation**
metà anno	Y	`val="YYYY" mod="MID"`
metà giornata	TOD	`val="XXXX-XX-XXTDT" mod="MID"`
prima metà dell'anno	Y	`val="XXXX-H1"`
seconda metà della settimana	W	`val="XXXX-WX" mod="END"`
prima metà del mese	M	`val="XXXX-XX" mod="START"`
seconda metà del giorno	TOD	`val="XXXX-XX-XXTDT" mod="END"`
prima metà del trimestre	M	`val="XXXX-QX" mod="START"`

4.2.7 Annotation of `temporalFunction`

"The value for this attribute will be positive (`true`) for those cases that do not contain all the information necessary to fill the higher-order (left-hand) positions in the `value` attribute . This will apply even if `value` can be completely filled, given additional information provided by the context" (ISO (2008): 59):

(223) *le 11 di mattina* (missing the particular day but recoverable from the context.)

```
<TIMEX3 temporalFunction="true"
value="2008-11-28T11:00">
le 11 di mattina
</TIMEX3>
```

(224) *la scorsa settimana* (missing the month and year.)

```
<TMEX3 temporalFunction="true" value="2008-W47>
```

"On the other hand, for cases in which the higher-order position of `value` are filled from the information provided by the tagged temporal expression, `temporalFunction` should be assigned a negative value" (ISO (2008): 60):

(225) *le 11 di mattina del 23 Maggio*

```
<TIMEX3 temporalFunction="false" value="2008-05-23T11:00">
le 11 di mattina del 23 Maggio
</TIMEX3>
```

Only "[d]urations whose length is underspecified will receive `true` as the value of `temporalFunction`" (ISO (2008): *ibid.*):

(226) *nei mesi scorsi*

```
nei
<TIMEX3 type="DURATION" value="PXM" temporalFunction="true">
mesi scorsi
</TIMEX3>
```

(227) *per 2 mesi*

```
per
<TIMEX3 id="t1" type="DURATION"
value="P2M" temporalFunction="false">
2 mesi
</TIMEX3>
```

4.2.8 Empty `TIMEX3` tag

TimeML allows the creation of empty, non-text consuming `TIMEX3` tags whenever a temporal expressions can be inferred from a text-consuming one.

Anchored durations with implicit anchoring references: the anchoring element is interpreted from the context. In this case a non-text consuming tag will be created referring to the implicit anchoring date.

(228) *un mese fa.* (DCT = 2008-12-02 tid="t0")

```
<TIMEX3 tid="t1" type="DURATION" value="P1M"
beginPoint="t2" endPoint="t0">
un mese fa
</TIMEX3>
</TIMEX3 tid="t2" type="DATE" value="2008-11-02">
```

(229) *alcuni mesi fa.* (DCT = 2008-12-02 tid="t0")

```
<TIMEX3 tid="t1" type="DURATION" value="P1M"
beginPoint="t2" endPoint="t0">
un mese fa
</TIMEX3>
<TIMEX3 tid="t2" type="DATE" value="PAST_REF"/>
```

(230) *ha svolto il suo mandato meno di un decennio fa e oggi si è ritirato a vita privata.* (DCT = 2008-12-02 tid="t0")

```
<TIMEX3 tid="t1" type="DURATION" value="P10Y"
beginPoint="t3" endPoint="t0" mod="LESS_THAN">
meno di un decennio fa
</TIMEX3>
e
<TIMEX3 tid="t2" type="DATE" value="2008-12-02">oggi</TIMEX3>
<TIMEX3 tid="t3" type="DATE" value="1998" mod="BEFORE"/>
```

Anchored durations with explicit anchoring date: the anchoring element is present in the text, a further empty `TIMEX3` is created to express the resulting date of the full construction:

(231) *il terremoto è avvenuto un anno fa oggi.* (DCT = 2008-12-02 tid="t0")

```
il terremoto è avvenuto
<TIMEX3 tid="t1" type="DURATION" value="P1Y"
beginPoint="t3" endPoint="t2">
un anno fa
</TIMEX3>
<TIMEX3 tid="t2" type="DATE" value="2008-12-02">oggi</TIMEX3>
<TIMEX3 tid="t3" type="DATE" value="2007-12-02"/>
```

Range expressions: range expressions involve two temporal expressions either of type `DATE` or of type `TIME`, which denote the begin and end points of an implicit duration. In this case a non-text consuming `TIMEX3` tag expressing the duration must be created:

(232) *Marco (oggi) è stato in palestra dalle 2 alle 5.*

```
dalle
<TIMEX3 tid="t1" type="TIME" value="2008-12-02T14.00">
2
</TIMEX3>
alle
<TIMEX3 tid="t2" type="TIME" value="2008-12-02T17.00">
5
</TIMEX3>
<TIMEX3 tid="t3" type="DURATION" value="P3TH"
beginPoint="t1" endPoint="t2"/>
```

Framing durations: as already stated framing relations denote temporal expressions where a date refers to a particular temporal frame whithin which the duration is located. In this cases two (potentially) non-text consuming tags of type `DATE` must be created to express the begin and end point of the duration:

(233) *i primi 6 mesi dell'**anno*** (DCT = 2008-12-02 tid="t0")

```
<TIMEX3 tid="t1" type="DURATION" value="P6M"
beginPoint="t3" endPoint="t4">
i primi 6 mesi
</TIMEX3>
dell'
<TIMEX3 tid="t2" type="DATE" value="2008">
anno
</TIMEX3>
<TIMEX3 tid="t3" type="DATE" value="2008-01"/>
<TIMEX3 tid="t4" type="DATE" value="2008-06"/>
```

(234) *una settimana dopo il 10 luglio.* (DCT = 2008-12-02 tid="t0")

```
<TIMEX3 tid="t1" type="DURATION" value="P1W"
beginPoint="t2" endPoint="t3">
una settimana dopo
</TIMEX3>
<TIMEX3 tid="t2" type="DATE" value="2008-07-10">
il 10 luglio
</TIMEX3>
<TIMEX3 tid="t3" type="DATE" value="2008-07-17"/>
```

4.3 <SIGNAL>: tag span

As it appears from the description of the SIGNAL markable, the span of this tag corresponds to the extent of the signals in analysis:

(235) *nei mesi scorsi*

```
<SIGNAL id="s1">
nei
</SIGNAL>
mesi scorsi
```

5 Annotation of link tags

The annotation of the link tags is quite straightforward and it follows from their description in section 3.1. However, some issues need examples and some instructions.

5.1 <TLINK>

TLINK is responsible for making explicit all kinds of temporal relations which may exist between the markables EVENT and TIMEX3.

As already stated, there may be three kinds of temporal relations:

(a.) between two temporal expressions:

(236) *Lunedì alle 20:00*

```
<TIMEX3 tid="t1" temporalFunction="false"
type="DATE" value="XXXX-XX-XX">
Lunedì
</TIMEX3>
</SIGNAL sid="s1">
alle
</SIGNAL>
<TIMEX3 tid="t2" temporalFunction="false"
type="TIME" value="XXXX-XX-XXT20:00">
20:00
</TIMEX3>

<TLINK timeID="t2" relatedToTime="t1" signalID="s1"
relType="IS_INCLUDED"/>
```

- between two events:

  (237) *Telefonate di insulti poi l' annuncio di una bomba*[7]

```
<EVENT eid="e1" eiid="ei1" pred="TELEFONATA"
class="OCCURRENCE" pos="NOUN" tense="NONE" aspect="NONE">
Telefonate
</EVENT>
di insulti
<SIGNAL sid="s1">
poi
</SIGNAL>
<EVENT eid="e2" eiid="ei2" pred="ANNUNCIO"
class="REPORTING" pos="NOUN" tense="NONE" aspect="NONE">
l'annuncio
</EVENT>
di una
<EVENT eid="e3" eiid="ei3" pred="BOMBA"
class="OCCURRENCE" pos="NOUN">
bomba
</EVENT>

<TLINK eventInstanceID="ei1" relatedToEventInstance="ei2"
signalID="s1" relType="AFTER">
```

- between an event and a temporal expression:

  (238) *Otto minuti dopo, l'esplosione.*

```
<TIMEX3 tid="t1" temporalFunction="true" type="DURATION"
value="P8TM">
Otto minuti dopo
</TIMEX3>
,
<EVENT eid="e1" eiid="ei1" pred="ESPLOSIONE"
class="OCCURRENCE" pos="NOUN" tense="NONE" aspect="NONE">
l'esplosione
</EVENT>

<TLINK eventInstanceID="e1" relatedToTime="t1"
relType="AFTER">
```

[7]Here the noun "bomba" must be tagged as an event instance due to coercion of the event "annuncio" which, being a nominalization, inherits the argument structure of its corresponding verb, which require an eventuality as its object argument.

One issue which we have not pointed out in the previous sections is the fact that TimeML and ISO-TimeML allow the creation of empty markable tags. We have already seen how this can be done with the TIMEX3 tag. Here, we want to explain the situations in which empty EVENT tags can be created, since these kinds of tags have a role for annotating TLINKs.
In most cases, the annotation of the single event instance present in the document is necessary and sufficient to perform all type of link relations. However, an additional EVENT tag must be created in some cases. These additional EVENT tags are empty (i.e. non-text consuming) and are a duplicate of the source EVENT tag. Their creation is motivated by the fact that sometimes a single event occurrence in the document expresses the occurrence of two separated event instances, which may have each a TLINK with another markable expression:

(239) *Marco ha insegnato lunedì e martedì*

As the example above shows, the event "*(ha) insegnato*" corresponds to two different instances, one which occurred "*lunedì*" and the other "*martedì*". To point out the fact that there are two instances of the same event, which have each a relation with a temporal expression, an empty event tag must be created. This procedure must always be kept present when annotating TLINKs.

5.1.1 Assigning the value to the attribute relType

The attribute relType is responsible for expressing the temporal relation which exists between two markable expressions. Among the 13 possible values, five of them are binary - one being the inverse of the other - namely: BEFORE and AFTER, INCLUDES and IS_INCLUDED, BEGINS and BEGUN_BY, ENDS and ENDED_BY, ENDS and ENDED_BY, The decision of which value to assign, depends on the annotator perspective of the directionality of the temporal relation:

(240) ***Rilevata*** *la presenza di gas in uno dei tubi trasparenti che compongono l'opera, i guardiani* ***hanno fatto scattare*** *uno speciale piano d'emergenza.*

The temporal relation between the two events in bold character, can be assigned value BEFORE, if the directionality is from the event "*rilevata*" towards the event "*hanno fatto scattare*"; or AFTER if the directionality is the other way round, i.e. from "*hanno fatto scattare*" towards "*rilevata*".

We present some examples and instructions for those attributes' values which need clarifications. For clarity's sake, in the following examples we will present only the annotation of the relevant entities involved in the temporal relations:

A. `SIMULTANEOUS`: it is assigned to two markables either when they are perceived as happening at the same time, or when they temporally overlap, or when they occur close enough that it is not possible to further distinguish their times. It is not possible to have a `SIMULTANEOUS` relations between a `DURATION` and an `EVENT`. This value is to be assigned also to the event arguments of perceptions verbs (when required and/or present):

(241) *Quando Wong Kwan ha speso 16 milioni di dollari per comprare la casa, pensò che fosse un buon affare.*

```
<EVENT eid="e1" eiid="ei1" pos="VERB"
class="OCCURRENCE" tense="PRESENT" aspect="PERFECTIVE"
polarity="POS" mood="NONE">
speso
</EVENT>
...
<EVENT eid="e4" eiid="ei4" pos="VERB"
class="I_STATE" tense="PAST" aspect="PERFECTIVE"
polarity="POS" mood="NONE">
pensò
</EVENT>

<TLINK eventInstanceID="ei1" relatedToEventInstance="ei4"
relType="SIMULTANEOUS"/>
```

(242) *Ho sentito una serie di esplosioni, poi il silenzio.*

```
<EVENT eid="e1" eiid="ei1" pos="VERB"
class="PERCEPTION" tense="PRESENT" aspect="PERFECTIVE"
polarity="POS" mood="NONE">
sentito
</EVENT>
...
<EVENT eid="e2" eiid="ei2" pos="NOUN"
class="OCCURRENCE" tense="NONE" aspect="NONE"
polarity="POS">
esplosioni
</EVENT>
```

```
<TLINK eventInstanceID="ei1" relatedToEventInstance="ei2"
relType="SIMULTANEOUS"/>
```

(243) *Marco è arrivato a Pisa alle 3.*

```
<EVENT eid="e1" eiid="ei1" pos="VERB"
class="STATE" tense="PRESENT" aspect="PERFECTIVE"
polarity="POS">
arrivato
</EVENT>
...
<TIMEX3 tid="t1" temporalFunction="false" type="DATE"
value="XXXX-XX-XXT15:00">
3
</TIMEX3>

<TLINK eventInstanceID="ei1" relatedToTime="t2"
relType="SIMULTANEOUS"/>
```

B. `IBEFORE` **and** `IAFTER`: these relations are specifications of the more general `BEFORE` and `AFTER` relations. They are not very much widespread in documents (for instance in the TimeBank (Pustejovsky et al., 003b) there are only 5 occurrences). Their annotation is subordinated to the presence of specific signals, like "*subito dopo*", or other discourse elements which indicate that the temporal span between the two entities involved is very short:

(244) *Il relax mentale è da fare subito dopo la respirazione.*

```
<EVENT eid="e1" eiid="ei1" pos="NOUN"
class="OCCURRENCE" tense="NONE" aspect="NONE"
polarity="POS">
relax
</EVENT>
...
<SIGNAL sid="s1">
subito dopo
</SIGNAL>
<EVENT eid="e3" eiid="ei3" pos="NOUN"
class="OCCURRENCE" tense="NONE" aspect="NONE"
polarity="POS">
la respirazione
</EVENT>
```

```
<TLINK eventInstanceID="ei1" relatedToEventInstance="ei3"
relType="IBEFORE"/>
```

5.1.2 Special uses of TLINK: the value IDENTITY

In section 3.1, we have illustrated the situations in which the value IDENTITY must be used. Here we will go into the details of some of them with annotated examples.

Causative constructions: the IDENTITY value must be used only in one case of causative constructions, that is when the verb "*causare*" has two events as its arguments. IDENTITY holds with the event in subject position:

- EVENT causare EVENT

  (245) *La pioggia ha causato delle alluvioni.*

```
La
<EVENT eid="e1" eiid="ei1" pos="NOUN"
class="OCCURRENCE" tense="NONE" aspect="NONE"
polarity="POS">
pioggia
</EVENT>
ha
<EVENT eid="e2" eiid="ei2" pos="VERB"
class="OCCURRENCE" tense="PRESENT" aspect="PERFECTIVE"
polarity="POS">
causato
</EVENT>
delle
<EVENT eid="e3" eiid="ei3" pos="NOUN"
class="OCCURRENCE" tense="NONE" aspect="NONE"
polarity="POS">
alluvioni
</EVENT>

<TLINK eventInstanceID="ei1" relatedToEventInstance="ei2"
relType="IDENTITY"/>
<TLINK eventInstanceID="ei1" relatedToEventInstance="ei3"
TLINK="BEFORE"/>
```

Light verb constructions (*costruzioni a verbo supporto*): in those cases when two event tags must be created to annotate a light verb construction, the TLINK value between the light verb and the nominal is IDENTITY:

(246) *Marco ha fatto una passeggiata.*

```
<EVENT eid="e1" eiid="ei1" pos="VERB"
class="OCCURRENCE" tense="PRESENT" aspect="PERFECTIVE"
polarity="POS">
fatto
</EVENT>
una
<EVENT eid="e2" eiid="ei2" pos="NOUN"
class="OCCURRENCE" tense="NONE" aspect="NONE"
polarity="POS">
passeggiata
</EVENT>

<TLINK eventInstanceID="ei1" relatedToEventInstance="ei2"
relType="IDENTITY"/>
```

To connect duplicated event tag: duplicated instances of an event must be linked via a `TLINK` with value `IDENTITY`:

(247) *Marco ha insegnato lunedì e martedì.*

```
<EVENT id="ei1" eiid="ei1" pos="VERB"
class="OCCURRENCE" tense="PRESENT" aspect="PERFECTIVE"
polarity="POS">
insegnato
</EVENT>
<TIMEX3 tid="t1" type="DATE" value="XXXX-XX-XX">
lunedì
</EVENT>
e
<TIMEX3 tid="t2" type="DATE" value="XXXX-XX-XX">
martedì
</EVENT>

<EVENT eid="e2" eiid="ei2" pos="VERB"
class="OCCURRENCE" tense="PAST" aspect="PERFECTIVE"
polarity="POS">

<TLINK eventInstanceID="ei1" relatedToEventInstance="ei2"
relType="IDENTITY"/>
<TLINK eventInstanceID="ei1" relatedToTime="t1"
relType="IS_INCLUDED"/>
```

```
<TLINK eventInstanceID="ei2" relatedToTime="t2"
relType="IS_INCLUDED"/>
```

5.2 <ALINK>

ALINK are created only in presence of ASPECTUAL events. The following examples present also inferred temporal relations, which must be created when necessary:

(248) *L'assemblea inizia alle 3.*

```
L'
<EVENT eid="e1" eiid="ei1" pos="NOUN"
class="OCCURRENCE" tense="NONE" aspect="NONE"
polarity="POS">
assemblea
</EVENT>
<EVENT eid="e2" eiid="ei2" pos="VERB"
class="ASPECTUAL" tense="PRESENT" aspect="IMPERFECTIVE"
polarity="POS">
inizia
<EVENT>
<SIGNAL sid="s1">
alle
</SIGNAL>
<TIMEX3 tid="t1" type="DATE"
value="XXXX-XX-XXT15:00">
3
</TIMEX3>

<ALINK eventInstanceID="ei1" relatedToEventInstance="ei2"
relType="INITIATES">
<TLINK eventInstanceID="ei1" relatedToTime="t1" signalID="s1"
relType="BEGINS"/>
```

(249) *Marco ha finito di leggere il libro.*

```
Marco ha
<EVENT eid="e1" eiid="ei1" pos="VERB"
class="ASPECTUAL" tense="PRESENT" aspect="PERFECTIVE"
polarity="POS">
finito
<EVENT>
```

```
di
<EVENT eid="e12" eiid="ei12" pos="VERB"
class="OCCURRENCE" tense="NONE" aspect="NONE"
vForm="INFINITIVE" polarity="POS">
leggere
</EVENT>
il libro

<ALINK eventInstanceID="ei1" relatedToEventInstance="ei12"
relType="CULMINATES">
```

5.2.1 On the difference between the values TERMINATES and CULMINATES

The values TERMINATES and CULMINATES reflect a difference in the main verb lexical aspect or *Aktionsaart*. Lexical aspect is an inherent feature of verbs or verb phrases and is determined by the nature of the event that the verb describes. A major distinction in lexical aspect is that between telic and atelic events. A telic event presents an action or event as being complete in some sense: the event is considered as realized when it has reached its natural endpoint (or goal). On the other hand, atelic events don't have endpoints, they do not culminate but simply finish. Aspectual verbs which indicates the end of an event, like "*finire*", "*terminare*", "*concludere*" etc., may give rise to either to ALINK with value TERMINATES, when the main verb is atelic, or with value CULMINATES when telic:

(250) *Marco ha finito di scrivere.* (atelic event)

```
Marco ha
<EVENT eid="e1" eiid="ei1" pos="VERB"
class="ASPECTUAL" tense="PRESENT" aspect="PERFECTIVE"
polarity="POS">
finito
<EVENT>
di
<EVENT eid="e12" eiid="ei12" pos="VERB"
class="OCCURRENCE" tense="NONE" aspect="NONE"
vForm="INFINITIVE" polarity="POS">
scrivere
</EVENT>

<ALINK eventInstanceID="ei1" relatedToEventInstance="ei12"
relType="TERMINATES">
```

Marco ha finito di leggere il libro. (telic event)

```
Marco ha
<EVENT eid="e1" eiid="ei1" pos="VERB"
class="ASPECTUAL" tense="PRESENT" aspect="PERFECTIVE"
polarity="POS">
finito
<EVENT>
di
<EVENT eid="e2" eiid="ei2" pos="VERB"
class="OCCURRENCE" tense="NONE" aspect="NONE"
vForm="INFINITIVE" polarity="POS">
leggere
</EVENT>
il libro

<ALINK eventInstanceID="ei1" relatedToEventInstance="ei2"
relType="CULMINATES">
```

5.3 <SLINK>

As already stated SLINK can be of two types: lexically based or structurally based.
The annotator has to create an SLINK relation every time there is a subordinating relation of the kinds we have illustrated in section 3.3 between two events. With respect to TLINK, SLINK does not necessitate to create empty EVENT tags when a single event has an SLINK relation with more that one event.

(251) *Marco non vuole venire.*

```
Marco non
<EVENT eid="e1" eiid="ei1" pos="VERB"
class="I_STATE" tense="PRESENT" aspect="PERFECTIVE"
polarity="NEG" modality="VOLERE">
vuole
</EVENT>
<EVENT id="e2" eiid="ei2" pos="VERB"
class="OCCURRENCE" tense="NONE" aspect="NONE"
VForm="INFINITIVE" polarity="NEG">
venire
```

```
</EVENT>

<SLINK eventInstanceID="ei1" subordinatedEventInstance="ei2"
relType="MODAL"/>
```

(252) *Marco ha detto che ha visto Chiara ma non ha chiamato Giovanni.*

```
Marco ha
<EVENT eid="e1" eiid="ei1" pos="VERB"
class="REPORTING" tense="PRESENT" aspect="PERFECTIVE"
polarity="POS">
detto
</EVENT>
che ha
<EVENT eid="e2" eiid="ei2" pos="VERB"
class="PERCEPTION" tense="PRESENT" aspect="PERFECTIVE"
polarity="POS" >
visto
</EVENT>
Chiara ma non ha
<EVENT eid="e3" eiid="ei3" pos="VERB"
class="OCCURRENCE" tense="PRESENT" aspect="PERFECTIVE"
polarity="NEG">
chiamato
</EVENT>
Giovanni.

<SLINK eventInstanceID="ei1" subordinatedEventInstance="ei2"
relType="EVIDENTIAL"/>
<SLINK eventInstanceID="ei1" subordinatedEventInstance="ei3"
relType="NEG\_EVIDENTIAL"/>
```

5.3.1 Annotating lexically based SLINKs

Lexically based SLINK are typically introduced by those event classes which normally take, or may take, an event as its complement argument, i.e. REPORTING, PERCEPTION, I_ACTION and I_STATE. The directionality of the SLINK is always from the main event to the subordinate one. The SLINK relType values may be constrained by the main event classes:

(a.) PERCEPTION events always instantiate SLINKs of type EVIDENTIAL or NEG_EVIDENTIAL.

(b.) I_STATEs and I_ACTIONs may introduce SLINKs of type MODAL, FACTIVE or COUNTER_FACTIVE. Modals verbs, which are always assigned the class I_STATE will always introduce SLINK of type MODAL.

(c.) REPORTING events instantiate SLINKs of type EVIDENTIAL or NEG_EVIDENTIAL:

(253) *Abbiamo appreso che l'attacco è concluso.*

```
Abbiamo
<EVENT eid="e1" eiid="ei1" pos="VERB"
class="REPORTING" tense="PRESENT" aspect="PERFECTIVE"
polarity="POS">
appreso
</EVENT>
che l'
<EVENT eid="e2" eiid="ei2" pos="NOUN"
class="OCCURRENCE" tense="NONE" aspect="NONE"
polarity="POS">
attacco
</EVENT>
è
<EVENT eid="e3" eiid="ei3" pos="VERB" class="ASPECTUAL"
tense="PRESENT" aspect="PERFECTIVE" polarity="POS">
concluso
</EVENT>

<SLINK eventInstanceID="ei1" subordinatedEventInstance="ei3"
relType="EVIDENTIAL"/>
```

(254) *L'andamento del mercato conferma che la congiuntura è difficile.*

```
L'
<EVENT eid="e1" eiid="ei1" pos="NOUN"
class="OCCURRENCE" tense="NONE" aspect="NONE"
polarity="POS">
andamento
</EVENT>
del mercato
<EVENT eid="e2" eiid="ei2" pos="VERB"
class="REPORTING" tense="PRESENT" aspect="IMPERFECTIVE"
polarity="POS">
conferma
```

```
</EVENT>
che la
<EVENT eid="e3" eiid="ei3" pos="NOUN"
class="STATE" tense="PRESENT" aspect="NONE"
polarity="POS">
congiuntura
</EVENT>
e' difficile.

<SLINK eventInstanceID="ei2" relatedToEventInstance="ei3"
relType="EVIDENTIAL"/>
```

5.3.2 Structurally based SLINKs

A. Purpose clauses and purpose complements: the event in the main clause will correspond to the value of the attribute `eventID`. The event in the purpose clause/purpose complement will be taken as the `subordinatedEvent` value. The `relType` value between the event in the main and in the subordinated clause/purpose complement will always be `MODAL`. Prepositions, like "*per*", or conjunctions, like "*affinché*", when introducing a purpose clause/complement must always be marked as `SIGNAL` (see section 2.4), and make explicit in the `SLINK` annotation by means of the attribute `signalID`:

(255) *I Fumagalli hanno incaricato un agente di cambio milanese di mettere a punto il progetto per la quotazione in Borsa.*

```
il
<EVENT eid="e3" eiid="ei3" pos="NOUN"
class="OCCURRENCE" tense="NONE" aspect="NONE"
polarity="POS">
progetto
</EVENT>
<SIGNAL sid="s1">
per
</SIGNAL>
la
<EVENT eid="e4" eiid="ei4" pos="NOUN"
class="OCCURRENCE" tense="NONE" aspect="NONE"
polarity="POS">
quotazione
</EVENT>
```

```
in Borsa

<SLINK eventInstanceID="ei3" subordinatedEventInstance="ei4"
signalID="s1" relType="MODAL"/>
```

(256) *Il Consiglio dei ministri ha approvato gli interventi per calmierare i mutui a tasso variabile.*

```
Il Consiglio dei ministri ha
<EVENT eid="e3" eiid="ei3" pos="VERB"
class="I_ACTION" tense="PRESENT" aspect="PERFECTIVE"
polarity="POS">
approvato
</EVENT>
gli
<EVENT eid="e2" eiid="ei2" pos="NOUN"
class="OCCURRENCE" tense="NONE" aspect="NONE"
polarity="POS">
interventi
<SIGNAL sid="s1">
per
</SIGNAL>
<EVENT id="e4" eiid="ei4" pos="VERB"
class="OCCURRENCE" tense="NONE" aspect="NONE"
vForm="INFINITIVE" polarity="POS">
calmierare
</EVENT>
i mutui a tasso variabile.

<SLINK eventInstanceID="ei2" subordinatedEventInstance="ei4"
signalID="s1" relType="MODAL"/>
<SLINK eventInstanceID="ei3" subordinatedEventInstance="ei2"
relType="FACTIVE"/>
```

B. Conditional constructions: the event in the antecedent clause (*apòdosi*) corresponds to the value in the `eventID` attribute. The one in the consequent (*protasi*), to the value of the `subordinatedEvent`. The conditional conjunction (e.g. "*se*" or "*quando*") will be marked as `SIGNAL`. The `relType` value of these `SLINK`s will always be `CONDITIONAL`.

(257) *Se da una parte si sviluppa la strategia delle acquisizioni, dall' altra si afferma il progetto di ricorrere al mercato.*

```
<SIGNAL sid="s1">
se
</SIGNAL>
da una parte si
<EVENT eid="e1" eiid="ei1" pos="VERB"
class="OCCURRENCE" tense="PRESENT" aspect="IMPERFECTIVE"
polarity="POS">
sviluppa
</EVENT>
la
<EVENT eid="e2" eiid="ei2" pos="NOUN"
class="STATE" tense="NONE" aspect="NONE"
polarity="POS">
strategia
</EVENT>
delle
<EVENT eid="e3" eiid="ei3" pos="NOUN"
class="OCCURRENCE" tense="NONE" aspect="NONE"
polarity="POS">
acquisizioni
</EVENT>
dall'altra è ormai in fase avanzata il
<EVENT eid="e4" eiid="ei4" pos="NOUN"
class="OCCURRENCE" tense="NONE" aspect="NONE"
polarity="POS">
progetto
</EVENT>
di
<EVENT eid="e5" eiid="ei5" pos="VERB"
class="OCCURRENCE" tense="PRESENT" aspect="PERFECTIVE"
vForm="INFINITIVE" polarity="POS">
ricorrere
</EVENT>
al mercato.

<SLINK eventInstanceID="ei1" subordinatedEventInstance="ei5"
signalID="s1" relType="CONDITIONAL"/>
```

The presence of the same event in several SLINKs is also possible in structurally-based SLINKs:

(258) *Marcos ha promesso di riprendere i negoziati se la zona di conflitto verrà smilitarizzata e il Parlamento approverà la legge sui diritti degli indigeni*

```
...
<EVENT eid="e2" eiid="ei2" pos="VERB"
class="ASPECTUAL" tense="NONE" aspect="NONE"
vForm="INFINITIVE" polarity="POS">
riprendere
</EVENT>
<SIGNAL sid="s1">
se
</SIGNAL>
...
<EVENT eid="e4" eiid="ei4" pos="VERB"
class="OCCURRENCE" tense="FUTURE" aspect="PERFECTIVE"
polarity="POS">
smilitarizzata
</EVENT>
...
<EVENT eid="e5" eiid="ei5" pos="VERB"
class="OCCURRENCE" tense="FUTURE" aspect="PERFECTIVE"
polarity="POS">
approverà
</EVENT>

<SLINK eventInstanceID="ei4" subordinatedEventInstance="ei2"
signalID="s1" relType="CONDITIONAL"/>
<SLINK eventInstanceID="ei5" subordinatedEventInstance="ei2"
signalID="s1" relType="CONDITIONAL"/>
```

6 It-TimeML DTD - stand-off annotation

```
<!ELEMENT It-TimeML ( EVENT | TIMEX3 | SIGNAL
TLINK | ALINK | SLINK )* >
<!ATTLIST It-TimeML xsi:noNamespaceSchemaLocation CDATA #IMPLIED >
<!ATTLIST It-TimeML xmlns:xsi CDATA #IMPLIED >

<!ATTLIST TimeML comment CDATA #IMPLIED >

<!ELEMENT EVENT EMPTY>
<!ATTLIST EVENT eid ID #REQUIRED >
<!ATTLIST EVENT eiid ID #REQUIRED >
<!ATTLIST EVENT anchor IDREF #REQUIRED >
<!ATTLIST EVENT class ( ASPECTUAL | I_ACTION | I_STATE |
  OCCURRENCE | PERCEPTION | REPORTING | STATE ) #REQUIRED >
<!ATTLIST EVENT pred CDATA #IMPLIED >
<!ATTLIST EVENT pos ( ADJECTIVE | NOUN | VERB | PREPOSITION
   | OTHER ) #REQUIRED >
<!ATTLIST EVENT tense ( NONE | PAST | PRESENT |
 FUTURE ) #REQUIRED >
<!ATTLIST EVENT aspect ( NONE | PERFECTIVE | IMPERFECTIVE |
   PROGRESSIVE) #REQUIRED >
<!ATTLIST EVENT vForm ( NONE | INFINITIVE | GERUND |
   PARTICIPLE) #REQUIRED >
<!ATTLIST EVENT polarity ( POS | NEG ) #REQUIRED >
<!ATTLIST EVENT mood ( SUBJUNCTIVE | CONDITIONAL | IMPERATIVE | NONE ) #REQUIRED
<!ATTLIST EVENT modality CDATA #IMPLIED >
<!ATTLIST EVENT comment CDATA #IMPLIED >

<!ELEMENT TIMEX3 EMPTY>
<!ATTLIST TIMEX3 tid ID #REQUIRED >
<!ATTLIST TIMEX3 anchor IDREF #REQUIRED >
<!ATTLIST TIMEX3 type ( DATE | DURATION | SET | TIME ) #REQUIRED >
<!ATTLIST TIMEX3 value NMTOKEN #REQUIRED >
<!ATTLIST TIMEX3 anchorTimeID IDREF #IMPLIED >
<!ATTLIST TIMEX3 beginPoint IDREF #IMPLIED >
<!ATTLIST TIMEX3 endPoint IDREF #IMPLIED >
<!ATTLIST TIMEX3 freq NMTOKEN #IMPLIED >
<!ATTLIST TIMEX3 functionInDocument ( CREATION_TIME |
EXPIRATION_TIME | MODIFICATION_TIME | PUBLICATION_TIME |
RELEASE_TIME | RECEPTION_TIME | NONE ) #IMPLIED>
```

```
<!ATTLIST TIMEX3 mod ( BEFORE | AFTER | ON_OR_BEFORE | ON_OR_AFTER
   | LESS_THAN | MORE_THAN | EQUAL_OR_LESS | EQUAL_OR_MORE | START |
   MID | END | APPROX )  #IMPLIED >
<!ATTLIST TIMEX3 quant CDATA #IMPLIED >
<!ATTLIST TIMEX3 temporalFunction ( false | true ) #IMPLIED >
<!ATTLIST TIMEX3 valueFromFunction IDREF #IMPLIED >
<!ATTLIST TIMEX3 comment CDATA #IMPLIED >

<!ELEMENT SIGNAL EMPTY>
<!ATTLIST SIGNAL sid ID #REQUIRED >
<!ATTLIST SIGNAL anchor IDREF #REQUIRED >
<!ATTLIST SIGNAL comment CDATA #IMPLIED >

<!ELEMENT TLINK EMPTY >
<!ATTLIST TLINK lid ID #REQUIRED >
<!ATTLIST TLINK relType ( BEFORE | AFTER | INCLUDES | IS_INCLUDED
   | MEASURE | SIMULTANEOUS | IAFTER | IBEFORE | IDENTITY
   | BEGINS | ENDS | BEGUN_BY | ENDED_BY ) #REQUIRED >
<!ATTLIST TLINK eventInstanceID IDREF #IMPLIED >
<!ATTLIST TLINK timeID IDREF #IMPLIED >
<!ATTLIST TLINK relatedToEventInstance IDREF #IMPLIED >
<!ATTLIST TLINK relatedToTime IDREF #IMPLIED >
<!ATTLIST TLINK signalID IDREF #IMPLIED >
<!ATTLIST TLINK origin CDATA #IMPLIED >
<!ATTLIST TLINK comment CDATA #IMPLIED >

<!ELEMENT ALINK EMPTY >
<!ATTLIST ALINK lid ID #REQUIRED >
<!ATTLIST ALINK relType ( CONTINUES | CULMINATES | INITIATES |
   REINITIATES | TERMINATES ) #REQUIRED >
<!ATTLIST ALINK eventInstanceID IDREF #REQUIRED >
<!ATTLIST ALINK relatedToEventInstance IDREF #REQUIRED >
<!ATTLIST ALINK signalID IDREF #IMPLIED >
<!ATTLIST ALINK comment CDATA #IMPLIED >

<!ELEMENT SLINK EMPTY >
<!ATTLIST SLINK lid ID #REQUIRED >
<!ATTLIST SLINK relType ( CONDITIONAL | COUNTER_FACTIVE |
   EVIDENTIAL | FACTIVE | MODAL | NEG_EVIDENTIAL ) #REQUIRED >
<!ATTLIST SLINK eventInstanceID IDREF #REQUIRED >
<!ATTLIST SLINK subordinatedEventInstance IDREF #REQUIRED >
```

```
<!ATTLIST SLINK signalID IDREF #IMPLIED >
<!ATTLIST SLINK comment CDATA #IMPLIED >
```

7 It-TimeML DTD - in-line annotation

```
<!ELEMENT It-TimeML ( #PCDATA | EVENT | TIMEX3 | SIGNAL
TLINK | ALINK | SLINK )* >
<!ATTLIST It-TimeML xsi:noNamespaceSchemaLocation CDATA #IMPLIED >
<!ATTLIST It-TimeML xmlns:xsi CDATA #IMPLIED >

<!ATTLIST TimeML comment CDATA #IMPLIED >

<!ELEMENT EVENT ( #PCDATA ) >
<!ATTLIST EVENT eid ID #REQUIRED >
<!ATTLIST EVENT eiid ID #REQUIRED >
<!ATTLIST EVENT class ( ASPECTUAL | I_ACTION | I_STATE |
  OCCURRENCE | PERCEPTION | REPORTING | STATE ) #REQUIRED >
<!ATTLIST EVENT pred CDATA #IMPLIED >
<!ATTLIST EVENT pos ( ADJECTIVE | NOUN | VERB | PREPOSITION
   | OTHER ) #REQUIRED >
<!ATTLIST EVENT tense ( NONE | PAST | PRESENT |
 FUTURE ) #REQUIRED >
<!ATTLIST EVENT aspect ( NONE | PERFECTIVE | IMPERFECTIVE |
   PROGRESSIVE) #REQUIRED >
<!ATTLIST EVENT vForm ( NONE | INFINITIVE | GERUND |
   PARTICIPLE) #REQUIRED >
<!ATTLIST EVENT polarity ( POS | NEG ) #REQUIRED >
<!ATTLIST EVENT mood ( SUBJUNCTIVE | CONDITIONAL | IMPERATIVE | NONE ) #REQUIRED
<!ATTLIST EVENT modality CDATA #IMPLIED >
<!ATTLIST EVENT comment CDATA #IMPLIED >

<!ELEMENT TIMEX3 ( #PCDATA ) >
<!ATTLIST TIMEX3 tid ID #REQUIRED >
<!ATTLIST TIMEX3 type ( DATE | DURATION | SET | TIME ) #REQUIRED >
<!ATTLIST TIMEX3 value NMTOKEN #REQUIRED >
<!ATTLIST TIMEX3 anchorTimeID IDREF #IMPLIED >
<!ATTLIST TIMEX3 beginPoint IDREF #IMPLIED >
<!ATTLIST TIMEX3 endPoint IDREF #IMPLIED >
<!ATTLIST TIMEX3 freq NMTOKEN #IMPLIED >
<!ATTLIST TIMEX3 functionInDocument ( CREATION_TIME |
```

```
EXPIRATION_TIME | MODIFICATION_TIME | PUBLICATION_TIME |
RELEASE_TIME | RECEPTION_TIME | NONE ) #IMPLIED>
<!ATTLIST TIMEX3 mod ( BEFORE | AFTER | ON_OR_BEFORE | ON_OR_AFTER
   | LESS_THAN | MORE_THAN | EQUAL_OR_LESS | EQUAL_OR_MORE | START |
   MID | END | APPROX )  #IMPLIED >
<!ATTLIST TIMEX3 quant CDATA #IMPLIED >
<!ATTLIST TIMEX3 temporalFunction ( false | true ) #IMPLIED >
<!ATTLIST TIMEX3 valueFromFunction IDREF #IMPLIED >
<!ATTLIST TIMEX3 comment CDATA #IMPLIED >

<!ELEMENT SIGNAL ( #PCDATA ) >
<!ATTLIST SIGNAL sid ID #REQUIRED >
<!ATTLIST SIGNAL comment CDATA #IMPLIED >

<!ELEMENT TLINK EMPTY >
<!ATTLIST TLINK lid ID #REQUIRED >
<!ATTLIST TLINK relType ( BEFORE | AFTER | INCLUDES | IS_INCLUDED
   | MEASURE | SIMULTANEOUS | IAFTER | IBEFORE | IDENTITY
   | BEGINS | ENDS | BEGUN_BY | ENDED_BY ) #REQUIRED >
<!ATTLIST TLINK eventInstanceID IDREF #IMPLIED >
<!ATTLIST TLINK timeID IDREF #IMPLIED >
<!ATTLIST TLINK relatedToEventInstance IDREF #IMPLIED >
<!ATTLIST TLINK relatedToTime IDREF #IMPLIED >
<!ATTLIST TLINK signalID IDREF #IMPLIED >
<!ATTLIST TLINK origin CDATA #IMPLIED >
<!ATTLIST TLINK comment CDATA #IMPLIED >

<!ELEMENT ALINK EMPTY >
<!ATTLIST ALINK lid ID #REQUIRED >
<!ATTLIST ALINK relType ( CONTINUES | CULMINATES | INITIATES |
   REINITIATES | TERMINATES ) #REQUIRED >
<!ATTLIST ALINK eventInstanceID IDREF #REQUIRED >
<!ATTLIST ALINK relatedToEventInstance IDREF #REQUIRED >
<!ATTLIST ALINK signalID IDREF #IMPLIED >
<!ATTLIST ALINK comment CDATA #IMPLIED >

<!ELEMENT SLINK EMPTY >
<!ATTLIST SLINK lid ID #REQUIRED >
<!ATTLIST SLINK relType ( CONDITIONAL | COUNTER_FACTIVE |
   EVIDENTIAL | FACTIVE | MODAL | NEG_EVIDENTIAL ) #REQUIRED >
<!ATTLIST SLINK eventInstanceID IDREF #REQUIRED >
```

```
<!ATTLIST SLINK subordinatedEventInstance IDREF #REQUIRED >
<!ATTLIST SLINK signalID IDREF #IMPLIED >
<!ATTLIST SLINK comment CDATA #IMPLIED >
```

References

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